Telephone Engineer

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Transatlantic Cable Is Coming

In this number of TELEPHONE ENGINEER we carry a review by F. J. Dommerque of the work of some of the German scientists who are studying the problem of submarine telephone cable across the Atlantic ocean. In recent news items there have been announcements by President Gifford of the American Tel. and Tel. Co. that engineers of that company have become convinced that such a cable is practicable and that most of the problems of its construction and operation are pretty well worked out.

The fact that the radio channels are now so congested that additional short-wave channels are in operation at times to supplement the main long-wave channel, is an indication that the commercial demand for inter-continental service has reached a point where more facilities are required. The great demand for the limited facilities of the ether and the difficulty of operation during unfavorable atmospheric conditions indicate the ultimate necessity of wire facilities.

Development now seems to have reached the point when it will be only a matter of a very few years until we have a transatlantic submarine cable suitable for telephone transmission and following that it is safe to assume that other cables will join North America to the other continents of the world. It is no idle dream but an actual prospect of the immediate future to say that the time will come when not 85 per cent but 100 per cent of the world's telephones will be interconnected.

The Value of a Program

"We have certainly learned the value of a program in our work on our lines," said the manager of one of the smaller telephone properties at a recent meeting of telephone men. He went on to say that for years his company had been in the habit of hiring a helper or two for the troublemen each summer and in that way giving the lines an overhauling during the summer months.

About two years ago the system was changed. As practically all of the lines were light country lines, a two-man gang consisting of a lineman and a helper was formed at one of the exchanges to do the line work over the entire system. If more men were needed for a particular job or if trouble work was light, the two trouble men were expected to help out. The company's territory is well developed and no large construction work is planned, but the two-man gang did all of the miscellaneous line work, minor extensions and similar work.

The manager then went on to explain the special feature of the system he had worked out. One project was laid out at a time. For instance, it might be the overhauling of the main lead in a certain highway. This would include replacement of weakened poles and cross arms, guying and straightening corner poles, trimming trees, pulling slack and any other work necessary to put the line in good shape.

This project was made the chief work of the gang for the time being. They were expected to be at work on it whenever they did not have work requiring immediate attention elsewhere. If the troubleman in the exchange had two or three hours or more to spare from his trouble work he joined the gang in the work on the project. When one project was completed, another was undertaken.

The manager described the results of the plan which indicated that it was working out very successfully. At first the troublemen did not find much time to help, but as the work progressed, trouble decreased and they were able to put in quite a large amount of time with the gang. The general appearance of the plant has been improved and service has shown a corresponding improvement.

While the system described by this manager is only one of many that might be worked out, it illustrates the results that can be obtained in relatively short time by a limited number of men. If there is an intelligent plan of work and proper supervision of the men who do the work, even the most run down plant can be improved greatly in a very few years without any extraordinary outlay of money at one time.

The Personal Service Attitude

On the afternoon of May first, which means "moving day" in many of our large cities, we sat in the office of a supervisor in the commercial department of one of the large telephone companies. While there we heard one side of a telephone conversation which we feel at liberty to disclose since it dealt only with routine matters that are handled by every telephone company.

In part, we heard the following conversation: "Yes, madam, this is the Telephone Company." "That certainly was sufficient notice. We should be able to get your telephone moved today. If you will wait a moment I will find out what is being done." The telephone was switched to another line and information was secured from the installation division involved. In a moment we heard the reply to the subscriber who was waiting on the line. "Mrs. Blank? This is the telephone company. One of our men has the order to move your telephone. We have a great many orders today and the men will work till they are all completed Unless something out of the ordinary happens you may expect a man to be at your home about four o'clock." "Thank you. Good-bye."

It was only a conversation on a routine matter, similar to hundreds of others on that day and other days, but type can not express the amount of interest and personal attention that was conveyed in the voice of the speaker we heard. To the subscriber, he represented the entire telephone company, and his attitude conveyed the impression that the entire telephone company was taking an especial interest in that particular move order.

He was able to do this because he really was interested in the completion of that order and every other order that was scheduled for that day. He could take that attitude because it was the attitude of his entire company. It is an attitude that, applied to all departments of the telephone business will, in time, solve even the most difficult of public relations problems.

"Telling the Editor"

A few days ago some one gave us a clipping from a daily newspaper in a small middle western city with the comment, "here is a new telephone invention that may interest you." We read the head lines which said something about two calls on the same telephone at one time and had visions of some new form of multiplex system until we read the body of the article. We then learned that a second line had been installed in the office of the secretary of the local manufacturers' association and that a key arrangement permitted the use of a single telephone in connection with either line.

What at first seemed to be some new development in the art turned out to be one of the substation wiring plans with which most telephone men are familiar through long years of use. We wondered how a story about such a device could command three-eighths of a column of space in a wide awake daily newspaper even in one of the smaller cities. But as we studied over the story we began to see that the thing that was well known to us might have a real news interest to the average man outside the telephone business.

After all, how many of our subscribers are familiar with the various wiring plans? There is one of the essentials of news; that it must deal with something not generally known. A second essential of news is also met since the story deals with a subject of universal interest. The telephone system of any town is a matter of interest to every resident. Added to these is the fact that the story tells of something new; of progress in the community, what makes it a desirable story from the news standpoint and one which the editor is glad to print.

It is too much to expect that a telephone man will have a professional writer's appreciation of news value of the things that happen in the course of his business, but the story in the clipping shows how ordinary things may have a real publicity value. Much publicity of value sometimes far in excess of paid advertising may be secured by "telling the editor" some of the ordinary things that happen.

The decision of the United States Supreme Court in the case of the St. Louis and O'Fallon Railway Company was handed down in the latter part of May.

This case was of high importance to railway companies as it involved the entire question of valuation upon which the recapture of profits by the government was based.

According to well informed observers, the most important part of the decision is the finding of the Supreme Court that the Interstate Commerce Commission had not given sufficient weight to cost of reproduction in making its valuation. In failing to do this the Commission had not obeyed the clear mandate of the Act of Congress ordering the railway valuation. The Supreme Court reaffirms its decisions in the Smyth vs. Ames and the Southwestern Bell case that no fair return can be determined without giving consideration to present costs of labor, materials, etc.

The greatest importance of the decision to telephone companies is in an indirect rather than a direct way. It will influence future valuations and will have some bearing on the willingness of regulatory bodies to give adequate consideration to cost of reproduction in valuations for rate making.

On the Practicability of a Transatlantic Telephone Cable

By F. J. DOMMERQUE
Fellow A. I. E. E.

The Aspects

The transatlantic telephone service by radio can only be considered as makeshift. It suffices to demonstrate that there exists a demand for telephonic communication between Europe and America; but as long as transatlantic conversations can be listened to by the whole world and as long as transatlantic telephone service is at the mercy of the caprices of the weather, and of ships and shops using the same ether as the medium of their message transportation, there will be the wish for something better, which permits of secret, permanent and undisturbed intercourse, all of which could be obtained if we had a cable for the exchange of telephone messages the same as is now in operation for the exchange of telegrams. That this wish is nearing fulfillment is well augured for by the reports received from two German scientists; the one, Dr. Zepf, general manager of the Felten & Guilleaume Cable Works at Cologne-Mühlheim, who invented a method of constructing such a cable, and the other, Dr. K. W. Wagner, professor at the Berlin-Charlottenburg Technical University, who developed by mathematical calculations the data for such a cable which satisfy the requirements demanded by the electrical qualifications such a cable must possess in order to permit of telephonic transmission in conjunction with, and equal to, the telephonic transmission of speech afforded on land.

It is not our intention to describe the experiments of Dr. Zepf, nor to recapitulate the calculations of Dr. Wagner, it will be sufficient to communicate the results. It will, however, be material to say something about the mechanical and electrical requirements imposed by the physical conditions under which a deep-sea telephone cable would have to operate and how these conditions are fulfilled.

In the year 1921 the laying of three deep-sea telephone cables about 105 nautical miles (195 km.) long was completed between Key West and Havana. The deepest part of the route was about 1000 fathoms (1,830 m.). At that time it was stated that such depths of water eliminated from consideration the use of paper-insulated cable such as is commonly employed for telephone purposes on land or in shallow water. The most suitable construction for great depths is the submarine telegraph type of cable with an insulation of gutta-percha or similar material."

In a transatlantic cable we have to reckon with considerable greater lengths of cable, and the first question that arises is, will it be possible to keep the attenuation inside practical limits with gutta-percha insulation, even in the event that the cable is loaded. In order to form an opinion on this subject, we have to know first the length of the longest part of the cable between Europe and America. Of course it is self-evident that in a transatlantic telephone cable all modern inventions and experiences are made use of to the fullest extent. Therefore repeaters of the vacuum tube type will be placed wherever possible. Hence, whenever the longest stretch of cable between two repeater points does not exceed the highest admissible attenuation, the route that contains such a stretch is the one to select.

Selection of Routes

On Fig. 1 a map of the Atlantic ocean is presented with the countries bordering on it on both sides. There are two routes across the Atlantic which could be divided into parts between continents and islands so as to bring these routes

Fig. 1

into possible consideration. The one route starts on the European side from Great Britain, proceeds to Iceland, thence to Greenland, whence it crosses to the coast of Labrador on the American side. This route appears on the map much longer than it actually is, because the map is drawn on Mercator projection; that is, it is flattened out. If one would trace the route on a globe, the difference in length would appear immediately. This is the route chosen by the Swedish fliers for a flight from Europe to America this summer. It may be suitable for flying, but it is not suitable for cable laying because the greatest part of it is covered with ice more than nine months in the year, holding out the prospect of an interruption of service during possible nine months in the year, as there would be no access to the cable for repair, if anything should happen to it during the nine months.

So it remains only the other route to be considered. This route commences in Portugal, goes to the Azores, thence to New Foundland and terminates at the north shore of Nova Scotia. To be more specific, we designate the route as Lisbon (Portugal)-Flores (Azores)-St. Johns (New Foundland)-Canso (Nova Scotia). The two longest stretches of this route are between Lisbon and Flores, and between Flores and St. Johns. In fact, these two stretches are practically of equal length, namely, in round figures, 2,000 km., or somewhat over 1,200 miles. The length is, of course, a most important item. Twelve hundred miles is 12 times the length of the Key West-Havana cables, certainly when considering the inequalities in the formation of the ocean bottom. Therefore, as far as attenuation is concerned, there is no comparison with the Key West-Havana cables. About this we will talk presently. First we will see whether the greater depth at midocean points is surmountable or not. The depth between Key West and Havana reaches a maximum of 1,830 m. (1,000 fathoms). Along the route Lisbon-St. Johns we have to count on as much as 5,000 m. (2,727 fathoms), which would mean that, if a gutta-percha cable is needed between Key West and Havana, it would certainly be needed on the transatlantic route. Here lies the wisdom of Dr. Zapf; he found a way to use a paper insulated cable at the depth of the ocean of 5,000 m. and more, and as is well known a paper cable permits of keeping the attenuation down.

Dr. Zepf's Invention

After all experiments with armored lead covered paper cables had shown that they could not be perfected so as to stand the pressure at great depths, he conceived the idea to form a hollow rope, the strands of which were given a wedgeshape, as illustrated in Fig. 2 where 12 of such wedge-shaped strands are laid in a circle so as to form a complete circular tube-like cross section. It will be seen that such a hollow tube cannot be compressed by any ordinary pressure. The most severe trials showed that it would withstand the pressure at a depth

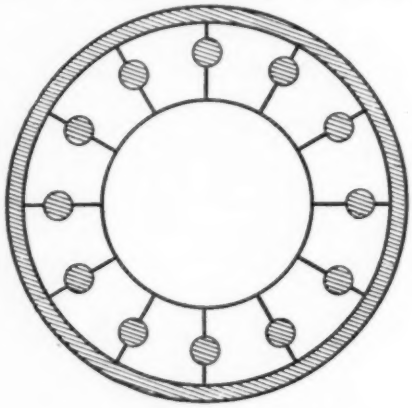


Fig. 2

of water even greater than the specified 5,000 meters. It will be noticed that the wedge-shaped strands have a semi-circular groove on each side. This is for the purpose of insertion of a steel wire to hold the strands in alignment. The hollow rope itself is made of aluminum so as to be of light weight. Around the rope a lead sheath is laid to make it water tight, a thickness of 1.5 mm. will be sufficient. The steel wires can be made a little smaller than the recesses in the wedgeshaped strands, so that they can be covered with a lead sheath, whereby the cable would become still more water tight.

Dr. Zepf furthermore found by experiments that the strength against compression remained the same for the same ratio of inside to outside diameter of the hollow rope, and that at a pressure of 20 per cent below the crushing point the rope cannot be crushed for a long time after the application of the pressure. He also found that wedge-shaped strands without the recesses and without alignment wires would work satisfactory. Also that a cable formed with this wedge-shaped rope would be pliable and flexible enough to permit of laying in the customary manner.

The Loading

Having settled the question of the kind of cable to be chosen in favor of the paper cable, we now can take up the attenuation problem. We know from the start that the cable has to be loaded in order to keep the attenuation down. The Key West-Havana cables are loaded by wrapping a single layer of iron wire 0.2 mm. (0.008 m.) in diameter around the inner copper wire, which with a layer of fine copper tapes forms the single conductor in each one of the three cables with sea-return. This way of increasing the inductance by wrapping an iron wire around the conductors is known as the "Krarup" or "continuous" loading. At the time the Key West-Havana cables were laid, the continuous loading was chosen because the use of coil loading was considered impracticable; it was anticipated that the coils would weaken the cable by imposing stresses upon it during laying. It was also feared that the water would penetrate the cable. Furthermore, from an electrical standpoint it seemed more desirable to retain the uniformity of the cables.

Since these cables were laid, great improvements have been made mechanically as well as electrically in the construction and efficiency of loading coils, which will overcome the disadvantages of a coil loaded submarine cable.

A coil loaded submarine telephone cable is nothing new in Europe. The first one was laid in 1906 across Lake Constance between Germany and Switzerland, about 10 miles long. Although the depth of water was not more than 250 meters (835 ft.), it proved that cables with coils inserted could be laid without danger. This cable, by the way, was protected against compression by winding a steel wire spirally around the cable core underneath the lead covering. This cable has given good service. The kind of coil used in this cable has been illustrated in TELEPHONE ENGINEER of April, 1928. Since its installation more cables with coil loading have been laid successfully in European waters.

The greatest improvement made in loading coils in late years is the application of premalloy to loading coil cores, of which mentioning is made at the close of the above-mentioned paper. By such means the dimensions of loading coils have been reduced to such a degree that their insertion in a cable will not interfere with its pliability and flexibility. The coils will easily run off the sheaves of the cable ship. They are enclosed in a casing which will withstand the great pressure to which they are to be submitted. The hollow space of the coil is closed tight against the hollow space in the cable to which it is connected so that a possible case of trouble will be confined to either the coil or the cable section as the case may be. The precautions taken against the entrance of sea water are such as to render cable and coils perfectly water tight. No trouble from mechanical construction may be anticipated.

Electrical Features of Loading and Cable

On account of its simplicity and of the high amplification required in the repeaters it seems that the four-wire repeater circuit is the most practical one to be selected. In this circuit four wires are divided into two pairs, one pair for

talking in one direction and the other pair for talking in the other direction. A short account of the four-wire repeater circuit was given in TELEPHONE ENGINEER of September, 1928. It is assumed for the present that the cable will contain one four-wire circuit only, with the assumption that this circuit may be used in the future for multiplex telephony, when more experience has been collected on the effect of crosstalk in the cable.

In order to determine the design requirements of the cable and its loading, it will be necessary to make some assumptions, the first one of which will have to be the admissible attenuation. Judging from past experience with recently laid telegraph cables, Dr. Wagner takes as a safe attenuation the value 10 Neper or 86.86 Decibels for a working frequency of 2,400 periods per second, which would give for the longest cable

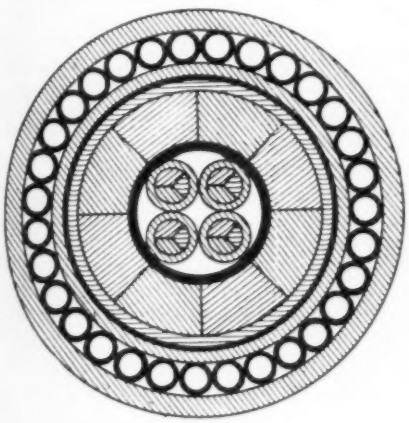


Fig. 3

part or stretch of 2,000 km. the attenuation constant $\alpha = 0.005$. As cut-off frequency f_o he takes 4,800 periods per second and determines the value of the distance s between coils by the formula $f_o = \frac{1}{\pi s \sqrt{LC}}$, the same formula given in our paper of February, 1928, on "Coil Loaded Lines." The values of the inductance L and capacitance C are depending on the conductor gage and the insulation. Dr. Wagner chooses for his calculation a conductor of 3 mm. diameter, which corresponds very nearly to a No. 9 American Wire Gage, which has a diameter of 2.907 mm. and obtains a capacitance $C = 0.045$ m. f. per km, taking the insulation in consideration. This C corresponds to about 0.072 m. f. per mile. From this the value of the coil distance is obtained as 2.025 meters (1.25 miles).

Although the best policy in general is to build the loading coils large, in order to obtain a low time constant, which means a low value for the ratio of the working frequency "f" to the cut-off frequency "f_o," Dr. Wagner fixes this ratio as 0.5 by taking the value of f_o as 4,800 periods per second, because it is essential to keep the coil dimensions small so as to be able to build coils into the cable without causing obstruction.

The inductance of a 3 mm. non-loaded cable would be negligibly small in comparison to the inductance of a loaded cable. The coils in a loaded cable introduce an additional inductance upon the line which Dr. Wagner figures to be 0.024 henry per km. or about 0.039 henry per mile. Thus the inductance of a section of 2.025 km. would be $L = 0.0241 \times 2.025 = 0.049$ henry.

The resistance of a coil is found by dividing the inductance 0.049 by the time constant as expressed by the ratio of the additional inductance to the additional resistance. Dr. Wagner determined the ratio as 0.015 for a frequency of 2,400 periods per second and thus obtained the resistance as $\frac{0.049}{0.015} = 3.2$ ohms.

As line impedance he found the value 742 ohms, which, however, has to be multiplied by a factor of correction depending on the leading-up section of the cable, which factor is rather complex. About this matter the reader is referred to our article in TELEPHONE ENGINEER of July, 1928, page 18.

The admissible attenuation of 10 Neper or 86.86 Decibel was taken at a frequency of 2,400 periods per second. Dr. Wagner calculates the attenuation at 200 periods per second, which may be assumed as the lowest frequency to be transmitted, to be 7.6 periods per second, which would leave a difference of 2.4 Neper, or 20.85 Decibel, which, of course, is liable to produce distortion of speech, if it was not equalized in the manner described in TELEPHONE ENGINEER of October, 1928, under "Crosstalk."

The same article speaks also of the transients. In the case of the transatlantic cable the transients for the frequency band to be transmitted are highest for the frequency of 2,400 periods per second. Dr. Wagner figures same to amount to 10.1 milliseconds, which, although somewhat high, is still acceptable. If, however, it would be found too high it might be decreased by a phase equalizer.

Cable Structure

In Fig. 3 is presented a cross section through a cable as it would appear with the embodiment of Dr. Zepf's invention and constructed after Dr. Wagner's theoretical investigation. This cable, however, is built with four conductors of 3.3 mm. diameter, slightly larger than Dr. Wagner's assumption, thus corresponding more to No. 8 American wire gage. The four conductors are individually insulated with paper and laid in quad formation; a paper covering is wrapped around the outside, giving the cable core an outside diameter of 14.7 mm. This core is surrounded by the hollow rope, which in this cable sample omits the alignment wires and is composed of only eight wedge-shaped strands. The outside diameter of this hollow rope is 25 mm. or practically one inch. The rope is then covered by a lead sheath of 1.5 mm. thickness and a layer of jute. Then follows the armor consisting of 33 steel wires of 2.5 mm. diameter and finally the outside covering of jute. A meter of this cable weighs 4.35 kg., which is about the same as 3 pounds per foot.

The loading coils are inserted with 2 km. (1.25 mile) spacing between them. Only one quad is shown in the cable, which will not endanger the flexibility of the cable through the insertion of the loading coils. Should a cable be desired with more than one quad, the coils would have to be so arranged that each quad has its own coil-sleeve.

The Commercial Side of the Cable

The question to be answered next is will such a cable pay? Its cost has been roughly estimated by Dr. Wagner to be about double that of a medium-sized gutta-percha telegraph cable with continuous permalloy loading. The telephone cable described would permit its use for ten telegraph channels in the frequency range from 0 to 125 periods per second. Each channel could be operated with printing telegraphs at the rate of 300 signals (five letter code) per minute, giving a total of 3,000 signals in each direction, which is four times the capability of the new German-American telegraph cable, Emden - Azores - New York. Thus the telegraph business over the transatlantic telephone cable should be a paying proposition by itself.

Telegraph messages can be sent day and night, as they can take their turn when a channel becomes free. But telephone conversations cannot be regulated that way. The only means to equalize telephone traffic is by charging different rates at different hours of the day or night, so as to distribute the messages

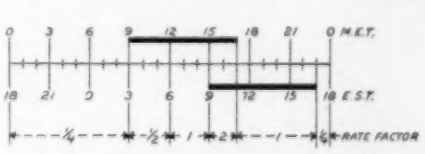


Fig. 4

according to their importance. In fixing the hours for such diversified rates it must be taken in consideration the difference in time between America and Europe. Dr. Wagner has drawn up a chart, which is reproduced in Fig. 4, wherein he gives his idea of such a rate arrangement. The horizontal axis is divided into the 24 hours of the day. The figures on top designate the hours in Middle European Time and the fig-

ures below the axis the hours in our Eastern Standard Time, which lags six hours behind. The heavy drawn horizontal lines indicate the busy hours on each side of the Atlantic. They overlap in two hours only. It will be noticed that the hours are counted continuously from 0 to 24. At the foot of the diagram the rate factors are given, 1 meaning full rate; 2, double rate; ½ and ¼, half rate and quarter rate, respectively.

Figuring on 48 paid conversation-minutes per hour and 300 working days in the year the diagram would give 81,600 conversations or calls of three minutes duration each. Even in case the cable rate would be made lower than the present radio rate, there should be a good profit available as the income from the telephone business would be practically all net gain.

Jamestown Telephone Corporation to Spend Over Million Dollars for Improvements

Announcement was made last week that the Jamestown Telephone Company, Jamestown, New York, would begin immediate construction of a new exchange building which, when completed, will house new automatic equipment for that city. It is estimated that the cost of building and converting the present equipment to automatic will be around $1,250,000. Modern in every detail is the watchword of the owners, according to John N. Wright, managing director. It is expected that the building will be completed and new equipment installed ready for service by November, 1930.

From the Jamestown Evening Journal of May 27 we publish the following extracts regarding the proposed improvements:

The new telephone building will be one of the handsomest and most impressive structures in the city. In its design the building will be a fine example of the modern school of office building architecture. The structure will have three stories with basement and sub-basement. It will have a frontage of 120 feet on Fourth street and a depth of 60 feet on Spring. At its rear, on Stiller's alley, there will be a garage, 115 feet long and 40 feet wide, of 30-car capacity, one floor and basement, for the company's fleet of cars and trucks.

The New York State Public Service Commission has authorized the Jamestown Telephone Corporation to issue bonds to the amount of $1,200,000 as required for the company's building program and to meet the cost of the new equipment and the changes required for the improved automatic service. The improvements authorized by the commission will not materially affect the present rates. Only a slight readjustment of rural and business rates is contemplated.

Following the merger in May, 1919, the company had a total of 6,068 subscribers' stations on its Jamestown exchange. This number has now increased to 9,387 on April 1, and is growing regularly every month. From the company's stations there originated last year a total of 19,696,000 local conversations, and 342,800 long-distance calls.

The Jamestown Telephone Corporation is now nearly 11 years old, having been incorporated September 23, 1918. Its officers and directors are: William J. Maddox, president; John H. Wright, vice-president; William M. Blackstone, secretary; M. R. Stevenson, treasurer. Directors, William M. Blackstone, Victor E. Cooley, Robert H. Jackson, P. O. Jacobs, William J. Maddox, M. R. Stevenson, W. B. Woodbury, Lloyd C. Wright and John H. Wright.

The company's operating personnel is as follows: John H. Wright, managing director; G. W. DeLong, plant superintendent; James Gardner, wire chief; Roy F. Mapes, traffic superintendent; Mabel P. Sellvin, chief operator; Lloyd C. Wright, general manager; Harold C. White, general auditor; A. E. Anderson, engineer.

The company had, on April 1, 1929, a total of 189 employes. It owns approximately 14,000 poles, about 3,210 miles of open wire, and 20,830 miles of wire in cable, of which 11,795 miles is in underground cable enclosed in 54.3 miles of underground conduit.

The telephone companies associated with the Jamestown Telephone Corporation are the Home Telephone Company, Ridgway, Pa.; the Meadville Telephone Company, Meadville, Pa., and the People's Telephone corporation, Butler, Pa.

Houston Wood Preserving Company's Plant Bought by Texas Creosoting Co.

Announcement has just been made of the purchase of the plant of the Houston Wood Preserving Company of Houston, Texas, by the Texas Creosoting Company of Orange, Texas, manufacturers of "Black Beauty" creosoted products. The combination of two of the best-known plants in the industry is of nation-wide interest. The Houston Wood Preserving Company has a modern creosoting plant, covering some forty acres and for a number of years has been serving many of the largest users of creosoted products.

Considering the length of time it has been in the field, the Texas Creosoting Company has had a remarkable growth. Starting from the ground up five years ago, this company constructed its first unit at Orange, Texas. Today, it is one of the foremost producers of creosoted materials in the United States, and its products are distributed throughout this country and in many foreign countries as well.

The red-top creosoted pole, which is a copyrighted idea of the Texas Creosoting Company, has attracted much attention among pole purchasers.

According to Mr. R. S. Manley, president of the Texas Creosoting Company, his organization will operate the newly acquired unit at Houston with the end of bettering the service now being offered users of creosoted materials in all fields.

TOO LATE TO CLASSIFY

WANTED—Position as wire chief with an independent company by a man 34 years of age with fourteen years' experience in telephone and electrical work, also a year's technical training. Can furnish excellent references as to ability, character, etc. Willing to invest in a growing company. Address E. B. E., care of TELEPHONE ENGINEER, 192 N. Clark St., Chicago, Ill.

Yards of the Houston Wood Preserving Company Recently Purchased by the Texas Creosoting Co., Orange, Texas

Studying Telephone Methods

By E. R. COLLINS

Manitoba Telephone System, Brandon, Manitoba, Canada

CHAPTER 28

In the previous chapter, we studied some of the features of coils used for automatic type of relays. In this chapter we will discuss some of the mechanical adjustments peculiar to this type. The shape of the armature is possibly the first thing we notice different to the relays commonly used for manual switching. The manual type of relays are designed so that they will group into small space. Each delay is usually covered with an individual dust cover. Groups of automatic relays are usually covered by a common cover, so that the relay can be constructed regardless of the type of cover to be used. The same type of frame work and armature may be used for all types of relays, whether quick acting or slow acting. The relay coils are interchangeable, and the spring assemblies are so designed that any grouping of springs may be made to suit the work to be done.

Here uniformity of adjustment must be adhered to. That is, relays of a certain type, doing the same work and common to the same group of telephones, or trunks, must be given a uniform adjustment, so that each relay will respond equally well in service. Before any spring adjustments are attempted, the armature must be so related to the core of the coil and the heel piece, on which it is mounted, that it will work without any loss or energy. Such losses may be caused by defective windings of coils, or improper adjustment of the armature itself.

"ROSES OF TODAY"

Albia, Iowa, June 3, 1929.

TELEPHONE ENGINEER PUB. CO.,
192 N. Clark St., Chicago, Ill.

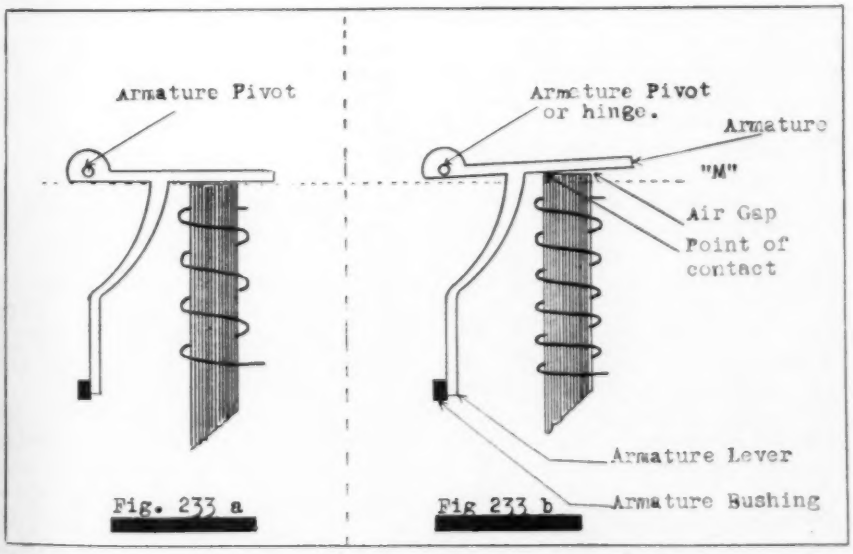
Gentlemen:

I want to say that the "ENGINEER" is a great paper and should be read by every plant man in the business. Mr. E. R. Collins' articles have been very good and I have been following them closely.

These articles are worth more than the price of the paper, to say nothing of the other good things that are included.

More power to you in making better telephone men.

Yours truly,
FRANK McKEEHAN.



In Fig. 233-a and b we have shown a part of a relay coil, and an armature. For clearness, the other parts of the relay are omitted. We learned in our previous studies that the pulling power of a magnet decreases very rapidly with the distance between the pole pieces, and the armature. Practically all the pulling power is confined to a space of a few thousandths of an inch away from the end of the core. Therefore any adjustment that prevents the armature from working in the most intense magnetic field, will weaken the operation of the relay. On a relay operating only a few springs, this is not so serious, but a relay armature that has to drive 7 or 8 pairs of contact springs must have a careful setting of the armature.

The armature in Fig. 233 pos. a is shown flat against the end of the core of the coil. This gives almost perfect magnetic contact, because the whole area of the core of the coil is in even contact with a corresponding area of the armature. But we will suppose that the coil in Fig. 233-b is raised, and the pivot point of the armature kept the same as in position "a." Then the armature will be in contact with one side of the face of the core, gradually tapering away from the core toward the right side. This produces a graduated air gap, and only a very small area of the core is in actual contact with the armature. Such an adjustment would make it impossible to adjust a relay with a heavy spring assembly. The armature must be parallel to the face of the relay core. We will describe the method of obtaining this adjustment as we progress.

In Fig. 234-a and b, we have added the heel piece to the relay coil. This heel piece is fastened at the lower end to the core of the relay coil, by a No. 8 iron screw. The reason for using iron at this point should be known. However, the writer has frequently found relays where a brass screw has been used, possibly because the iron screw was lost out while changing a coil. The use of a brass screw will weaken the path of the magnetic lines simply because part of the magnetic material is missing. A brass screw might be used, and not cause trouble, except on very heavy spring assemblies. The armature is the part of the relay that must be moved, therefore we require the most intense magnetic field between the upper end of the heel piece and the upper end of the relay coil.

The armature may be fastened to the end of the heel piece with tapered set screws called *trunion screws*, or it may be built in the form of a hinge and part of the hinge fastened to the heel piece. This part of the armature we have shown in heavy black, and call it the armature mounting bracket. This bracket is fastened to the heel piece with a No. 6 screw and an iron washer. The opening in the bracket is slotted, so that the bracket may be set up or down on the heel piece. If the bracket is set down too low, the armature will come in contact with the end of the heel piece. This will prevent it moving down low enough to touch the end of the core. This is shown in Fig. 234-b, the point of contact or bind being marked. Now this bind might be present, even though it might not be noticeable to the naked eye. There might be a slight bind just as the armature comes into position before the core. At the same time the armature

lever has driven the springs toward the left. The pressure of the springs is increasing as they are driven out of their natural alignment. Just at the point where the spring pressure is the greatest against the armature lever, this bind comes into play, and the armature will find difficulty in making its full stroke. A slight fall in the voltage of the storage

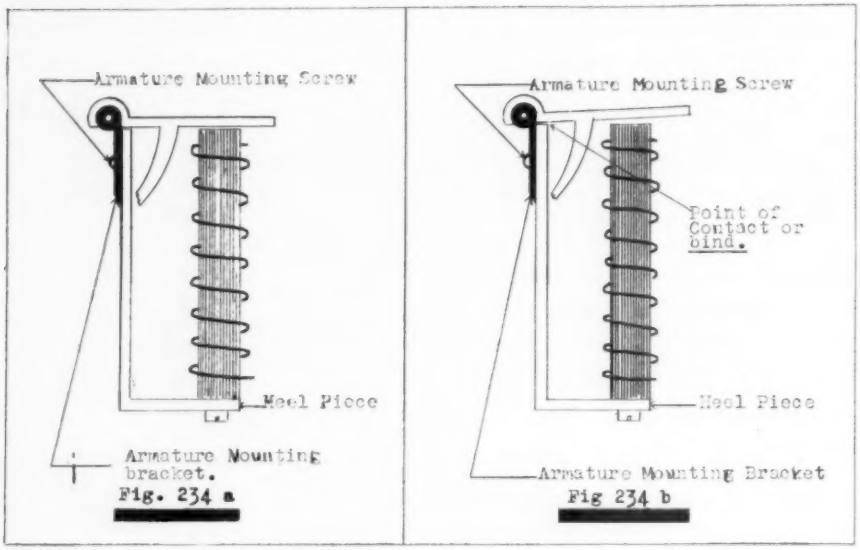


Fig. 234 a Fig 234 b

battery would have a very bad effect on such a relay, and might even prevent it from operating.

Adjusting the Armature

Armature adjustments require the use of thickness gauges. These are thin strips of steel, accurately rolled to a known thickness. A nest of thickness gauges ranging from .0015 to .025 inches can be purchased. These gauges are bent as shown in Fig. 235, so that they can conveniently be slipped under the armature of a relay. They are attached to a ring, and can easily be removed for use. Select a gauge, say, .005 or 5/1000 (five one thousandth) of an inch. Loosen the armature mounting screw,

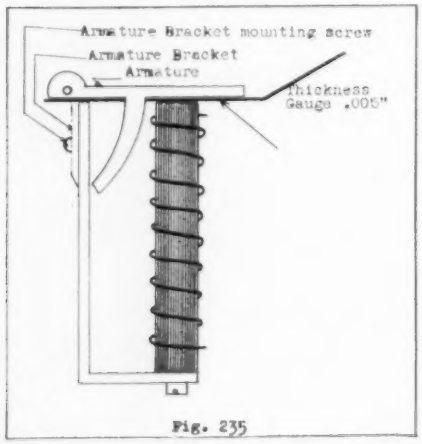


Fig. 235

and then pass the thickness gauge under the armature so that it covers the core of the coil and the upper end of the heel piece. If there is a brass residual screw in the armature, remove it for this adjustment. Then close the circuit to energize the coil of the relay being adjusted. This will bring the armature into firm contact with the thickness gauge. The armature mounting bracket will be free to move on account of the mounting screw being loose. Next tighten the mounting screw. Now there will be an even separation of .005 inch between the armature and its core and heel piece.

When the thickness gauge is removed, the armature will be free to come into its operated position without bind. If the core of the coil and the heel piece are of uniform length, the armature will also lie parallel to the face of the core, on account of the slack in the hinge pin and bearings.

Residual Adjustments

A slow acting relay may be allowed to operate until its armature touches the core as in Fig. 234-a. In this case a slow release action is desired. However, this releasing action may become too slow due to dust and extremely small particles of iron due to wear of the armature, will accumulate on the face of the core, and on the armature. This must be cleaned off to allow the relay to release in its proper time. Sand paper or emery cloth, or other abrasives must not be used to clean these surfaces. If these are used, the rust proof coating on the iron will be removed, and the iron will then be subject to rust. Use a piece of ½-inch cotton twill tape to pass between the armature and the core. When in place, press on the armature firmly and pull the tape up and down between the armature and the core face. If this does not clean the surface sufficiently, then dip the tape in some gasoline, or preferably in carbon tetrachloride, as this will not burn, and then clean the armature with the wet tape. This will clear the worst cases of sticking relay armatures.

Quick acting relays on the other hand must be able to respond to impulses in quick succession. If the armature is allowed to touch the core in this case, the armature will not release quickly enough to allow its normal contacts to make when the release occurs. This speed of release may be quickened by a heavier spring tension, or it may be speeded up by inserting a brass screw in the armature so that the brass screw touches the core instead of the armature. This is illustrated in Fig. 236.

You will notice that while there is an air gap between the armature and the core, caused by the residual, that this air gap is of a uniform depth for the whole surface of the core. In Fig. 233-b this air gap was tapered. The speed of the relay release can be increased by inserting the brass screw further in. Each type of relay will require a specific air gap. This is specified by the manufacturer in terms of thousandths of an inch. A common thickness is .0015 inch. Suppose this is called for. Then select this gauge and insert it under the armature just far enough to miss the residual screw, as shown in Fig. 236. Next energize the coil. Loosen the locknut of the residual screw and turn the screw partly

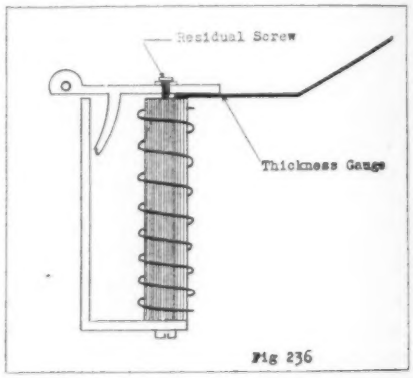


Fig 236

out. Use a standard *adjusting wrench and screw driver* for this purpose. There will be a heavy pressure on the thickness gauge. Now turn the screw in slowly, at the same time holding the gauge. When the screw hits the core, the difference in pressure on the gauge will be felt. There will be a certain pull due to the magnetic pull on the gauge. At the point where the difference in pressure is first felt, lock the residual screw. A little practice will enable you to detect this point easily. All relays of a certain kind must be given the same residual setting. This setting should be checked at least once a year, to make corrections due to wear on the residual screw.

In Fig. 237, we have shown the relay equipped with a pair of contact springs. These springs are mounted on the heel piece at the lower end. The heel piece is 1 inch wide. The spring assembly is mounted as follows:

First there are two No. 6-32 iron screws passed through a two-hole iron washer Then a fiber insulator, spring

No. 2, another insulator, and Spring No. 1, another insulator, and a metal piece called an armature back stop. The back stop regulates the distance that the armature can move away from the core. The insulators are made of a material called

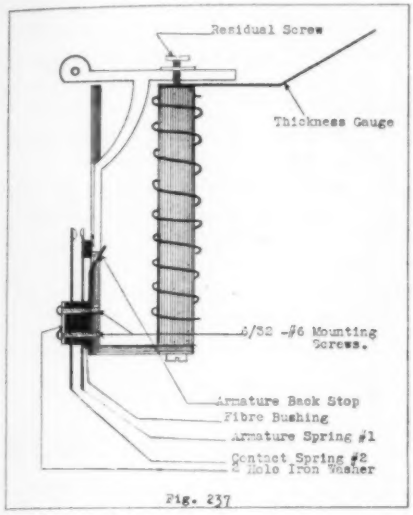


Fig. 237

phenol fibre. This has about the same rate of expansion as the iron screws used. When the whole assembly is screwed in place on the heel piece, and tightened, the springs will not loosen, due to changes in temperature. Thus these relays will work as well in Cuba where it is hot, as in Canada where it gets mighty cold.

The armature must move its lever to the left, so that the armature spring No. 1 will come in contact with spring No. 2 and drive spring No. 2 to the left at least a distance equal to its own thickness. This not only insures good contact, but at the same time there is a sliding motion between the contacts which removes any dirt or dust on the surfaces of the contacts. To obtain a uniform adjustment of this armature stroke we again use the thickness gauge. Each relay has the proper gauges specified for its particular adjustment. These should be adhered to for all relays of a kind, to give a uniform operation. Suppose two gauges are specified, as .006 inch and .004 inch. Insert the .006 inch gauge under the armature so that it will be between the core and the residual screw.

Energize the relay, and bend the armature lever with an armature bending tool, so that the bushing just begins to move spring No. 1, but does not drive it far enough to come in contact with spring No. 2. There will likely be a relay or other device connected to springs 1 and 2. This of course will operate when contact is made, so that the adjuster can judge by the sound of this second relay operating when contacts 1 and 2 are closed. With the .006 gauge inserted, then the contacts must not close. Then insert the .004 gauge and operate as before. Now the contacts must close. Spring No. 2 may be bent in to allow contact to be made when the .004 gauge is used. Now remove the gauge and operate the relay again. Spring No. 2 will be observed to travel out of line when the armature completes its stroke. This has given us then the necessary travel of spring No. 2 to insure good contact, also the wiping action.

The shape of the armature gives a lever motion. That is if the armature travels towards the core .002 inch, the armature will travel to the left at least .004 inch. This means that twice the force must be applied to the center of the armature, to move the springs, that would be required to move them the same distance if the force was applied to the springs at the armature bushing. For example a certain relay would operate its contacts a full stroke, if 400 grams pressure is applied at the center of the armature over the residual screw, and only 200 grams pressure is needed to move the springs the same distance when applied at the back of the armature bushing. Another relay required 150 grams at the bushing and 300 grams at the armature. Two hundred grams would be equivalent to about 7 ounces. This leverage permits a wider spring movement than would otherwise be possible, and at the same time the armature is always working in quite an intense field.

The reader will see, therefore, the necessity of making the armature adjustments first before attempting any spring adjustments. When a relay is giving trouble, and will not respond to a very slight spring adjustment, commence a check of the armature settings.

1. Reseat the armature as shown in Fig. 235.
2. Reset the residual screw to agree with the requirements for the particular relay as shown in Fig. 236.
3. Check the stroke of the armature as called for in the adjusting sheet for the particular relay.
4. If a current flow test set, or resistance box is available, check the current flow in the coil for operate and non-operate positions, at the same time varying the tension of the springs.
5. If the relay is still balky, check the resistance of the coil winding.
6. Check the springs used by comparing them with a good relay with a similar assembly. It is a very easy matter when changing springs to use one a little heavier or lighter than the one required. This will place a load on the armature different to the load provided for by the adjustments specified for this relay.

Spring Assemblies

The method of assembling the springs is shown in Fig. 238. The shape of the armature spring and contact spring is shown. The shape of these two springs is general. There will be variations due to type of contact, thickness of spring, double or single contacts. Spring No. 1 may have the soldering lug at the bottom of the spring as shown in Fig. 238, or it may be at the top of the spring, similar to the position of the soldering lug on No. 2 contact spring. Thus two springs may be similar in every respect, except the soldering lug.

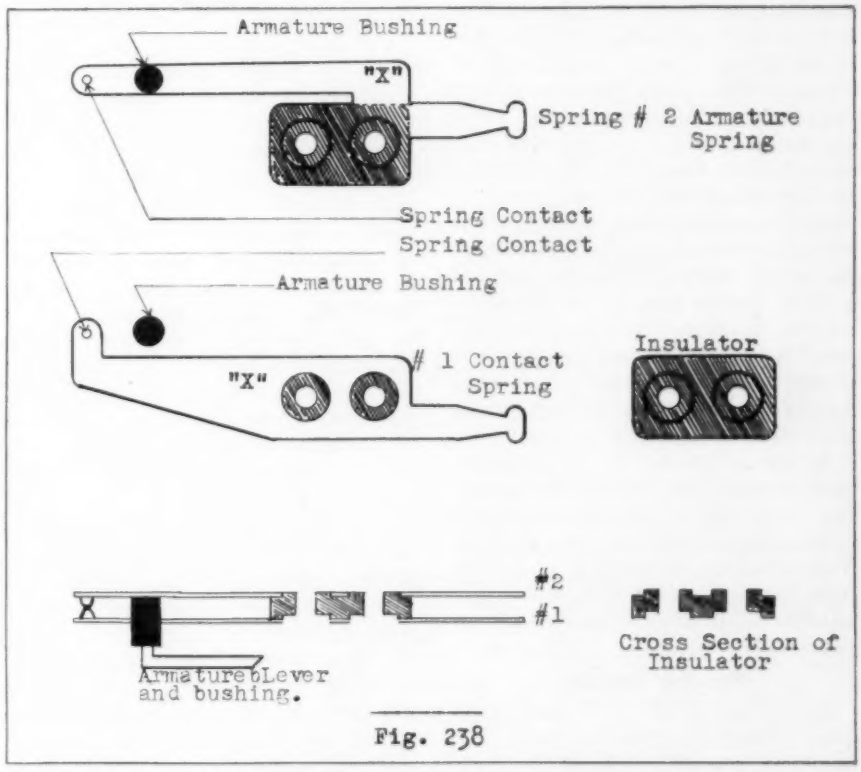


Fig. 238

The armature bushing rests against the blade of the armature spring No. 2 as shown in Fig. 238. The armature bushing passes clear over the top of the contact spring No. 1 as shown in the drawing.

Referring to the lower portion of Fig. 238, you will see that the springs are normally in contact. The armature moving upward will drive spring No. 2 away from No. 1. The spring nearest to the armature and the heel piece is always No. 1. Suppose we had another pair of springs above 1 and 2, and called them 3 and 4. If we had a hard rubber bushing set in spring 4 facing downward, above the armature bushing, then spring No. 3 could be a contact spring similar to No. 1. The armature would then be able to move springs 2 and 4 away from springs 1 and 3. Thus we can make a pile of springs, the motion from one spring being passed on to another by the use of hard rubber bushings.

The construction of the insulator is rather unique. These insulators are punched from fiber sheets. A hole large enough to admit of a No. 6-32 screw is punched right through the fiber, and then a larger circle is punched, but the circle is only driven part way out of the insulator. The outside diameter of this larger circle is the same as the hole in the springs. This is shown in the cross section of the insulator in Fig. 238. Now if this is fitted between two springs as shown in the lower part of the drawing, the projecting circles will extend through the spring. This will hold the spring in a fixed position against the insulator. Another insulator would then be fitted under spring No. 1 and its projecting circles would extend upward through spring No. 1 into the recesses in the lower side of the upper bushing. Thus if a pair of screws is passed through these bushings and springs, the springs may be clamped in position so that their contacts come exactly opposite each other. The projecting circles will be driven back into their insulators where thin springs are used and the screws are tightened.

Bending Springs.

Spring tension should always be applied at the heel of the spring. If tension is to be applied to spring No. 1, the bending tool or duck bill plyers should be applied as close to the insulator as possible, as indicated at "X." The tension to spring No. 2 can best be applied as at "X" on spring No. 2. The springs should be free of bends or kinks from "X" to the contact end of the springs. Round nose plyers are not suitable for this purpose as the bearing surface being narrow will be apt to put a sharp bend in the spring. Plyers called duck bill plyers, having a wide surface at the points, are suitable for bending springs. The use of the standard spring bending tools, however, is recommended as they enable you to give the proper tension to the spring without making bad bends.

Cleaning Contacts

Contacts of relay springs are very important. Their surfaces must be kept clean and smooth. Never use contact files on the small contacts of relay springs. If a spring is so badly pitted as to require filling, better change the spring at once. Relay springs may be given a dry cleaning with a good nail brush. This is really an overgrown tooth bruth. After the contacts have been brushed, use a burnishing tool or contact cleaning tool to clean any particles of dust that may have been dropped in from the brushing. Contacts that have become very dirty may be cleaned by using an orange stick sharpened. Dip this into some carbon tetrachloride and pass between the dirty contacts. Wipe the stick off with some cheese cloth and repeat the operation until the dirt is removed. Be careful to clean the stick between each dip in the liquid, else the liquid will become so dirty that it will place dirt on other contacts.

We will have to discuss in further detail the individual requirements of relays used for specific purposes as we continue with our study. The foregoing should give the beginner some idea of the relay requirements. Some of the work these relays have to do will be discussed in the next issue.

Conditions Good in Far East, Reports the International Tel. & Tel. Corporation Head

G. E. Pingree, president of the International Standard Electric Corporation, who has just returned from several months' visit to associated companies in the Far East, reports an improvement in the general economic and industrial conditions in Japan. He stated that the Tokyo factory of the Nippon Electric Company, Ltd., an associated company, is being rebuilt on a much larger scale than the old factory, which was partially destroyed by the earthquake, and that the construction of the new plant is such that it will withstand any further earthquake, even though they prove to be more serious than the last one.

"The Japanese Government, which operates the telephones and telegraphs throughout the country, is proceeding in an orderly fashion with the installation of automatic telephone exchanges and loaded interurban cables," Mr. Pingree said.

"Our Associated Company in China, the China Electric Company, Ltd., is doing a very satisfactory business, although its government business is somewhat restricted due to civil war. The Shanghai Mutual Telephone Company, operating the telephones in the foreign settlement of Shanghai, is going ahead rapidly with the installation of central office equipments of the Rotary type, which has been installed so extensively throughout the European countries. The China Electric Company is also installing new Rotary machine switching equipment in Canton, which will be cut into service during the next few months."

Mr. Pingree said that Canton, during the last few years, had become modernized to a very remarkable degree, one of the principal improvements being the cutting through of broad paved streets totalling in all forty-two miles.

The International Standard Electric Corporation is the principal manufacturing organization of the International Telephone & Telegraph Corporation.

Wawasee, Indiana, District Meeting June 25, 26 and 27

Announcement has been made that the annual meeting of the Northern Indiana Telephone Association will be held at Lake Shore Inn, Wawasee Lake, Ind., June 25, 26 and 27. This is a very interesting and instructive meeting each year and affords an opportunity of mixing business with pleasure, as this is one of the beautiful lakes of Indiana, with all conveniences, hotels, cottages or camping. Plan to make this convention. Roscoe Pontius of Rochester is president.

H. A. Seamark to Take Over Illinois Territory for Kellogg

Another practical telephone man in the person of Mr. H. A. Seamark has joined the ranks of Kellogg sales representatives. He will travel the state of Illinois for the pioneer telephone manufacturer.

There has been nothing theoretical about Mr. Seamark's experience in the telephone field. He has acted as groundman, lineman, foreman, installer, and supervisor over construction, reconstruction and maintenance in common battery and magneto plants.

He has also had over five years' experience preparing estimates for telephone work, and over six years in telephone plant accounting.

Previous to his connection with the Kellogg organization, he was with the Lincoln Telephone & Telegraph Company of Lincoln, Nebraska, for about twelve years, and just recently has been directing operations for the W. N. Albertson Company of Omaha.

Practical Suggestions for Plant Valuation

By CHARLES W. McKAY, M. E.*

Thus far in this series we have confined ourselves to a study of ways and means of taking inventories and appraisals.

The primary function of appraising is for rate making purposes, and in this and subsequent chapters the writer will endeavor to show how the appraisal fits into the practical rate making problem.

Underlying Theory of Telephone Rate-Making.—In the opening chapters of this series the various uses of the telephone appraisal were discussed in some detail. Of these uses the function of the appraisal in building up reserve funds and the function of the appraisal in rate-making probably are the most important. The function of the appraisal in building up the depreciation reserve was discussed in the previous chapter. In the present chapter the function of the appraisal in telephone rate-making will be considered.

Anyone who has glanced over the record of a rate case without previous acquaintance with the subject may conceive the idea that the matter of telephone rate-making is very complicated. The records of rate cases are apt to be voluminous and are likely to convey an impression of complexity. The underlying theory, however, when shorn of all of the frills which must necessarily be added in the course of adjudications before regulatory bodies, is exceedingly simple.

It is only necessary to ascertain the value of the property to determine upon a fair rate of return on this valuation, and to provide rates adequate to produce this return. There are, of course, other factors that enter into rate problems, but these are merely steps in the solution of the problem.

Early History of Rate Regulation.—Before taking up a detailed consideration of the problem of rate adjustment it may be interesting to review briefly the history or rate regulation and the part that it has played in the development of the subject of public utility appraisals.

Long before the public utilities, as we know them, came into existence, periodical attempts were made to regulate certain public enterprises. As suggested in the opening chapter, boat traffic on the River Thames was subject to a form of commission regulation early in the eighteenth century. A little later some of the stage coach or bus lines operating in and about the city of London were subject to certain rules and regulations laid down by the county authorities. These early attempts, however, were never very vigorous, and were soon given up entierly.

In the latter part of the nineteenth century, with the advent of the modern public utilities, the State of Massachusetts took up the problem of rate regulation in earnest, and the first real public utility commission was formed. During the first few years of the Massachusetts commission's existence there was a reasonable doubt in the public mind as to whether the large expenditures involved in the establishment and maintenance of such a commission were justified. As time passed, and the public realized the good work that was being done in the way of regulating rates and improving the quality of the service of the various utility corporations in Massachusetts, the scope of the commission's work was enlarged and its future assured.

In the meantime, people in other states had been watching the experiment, and early in the twentieth century three new commissions were formed, two of them in the State of New York and one in Wisconsin. All of these early commissions gave special attention to the problem of rate regulation, and, as an aid to their investigation of rate problems, did everything in their power to develop the science of utility appraisement.

Development of Appraisal Methods.—At first, appraisals were made entirely by what may be termed "Book value method." Estimates of value were made by accountants, based largely upon the record of property values as shown in the company's books. In some instances capitalization was the sole basis of determining property values. If a company was capitalized at $500,000, this figure was assumed to be the proper base for determining rates. In other cases a conscientious effort was made to determine the actual investment in the property as shown by the books. It was soon found, however, that the book value method gave most unsatisfactory results, and that records of original invetment were often difficult to determine.

Next came the original cost method. Regulatory bodies and appraisal experts, having agreed that the book value method was a failure, cast about for a more satisfactory means of determining utility property values. The original cost method, as we have seen, consists of a careful determination of the actual original cost of a property. Records of original cost are often difficult to determine, and even when they can be determined they do not necessarily present a fair index of property values. Appraisal experts and commissioners soon found this to be the case, and again cast about for a satisfactory method of valuation.

Finally the reproduction cost theory was developed, and reproduction cost is now universally conceded to be one of the most important factors in the determination of fair utility values for rate-making purposes. Some of the leading legal authorities have ruled that original cost, depreciated value and the capitalization should also be taken into account in determining the fair value of utility property; but they all concede that the reproduction cost, if not the most important, is at least one of the most important, factors.

Distinction in Figures Used for Value.—In this connection it is interesting to note that one of the large western utility companies has, in its recent rate cases, under a distinction between "value" and "value for rate-making purposes." In other words, in submitting an appraisal value of its properties to be used as a basis for rate adjustments it reserves the privilege of claiming a much higher figure as the true value of the property.

In the matter of franchises, for instance, this company claims that its franchise privileges have a far greater value than the actual cost of securing the franchises, and it will be remembered that franchise cost is the only franchise value allowed by public utility commissions. The stand of this company is most interesting, and it may have considerable bearing upon future appraisal work.

Factors Involved in Solution of Any Rate Problem.—There are five factors to be taken into consideration in the solution of any rate problem. These factors may be briefly summarized as follows:

1. The value of the property as determined by the appraisement.
2. Operating expenses.
3. Annual depreciation.
4. Revenue.
5. Rate of return which may be allowed on the valuation.

Operating Expenses and Net Revenue.—The correlation of the five factors

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mentioned in the preceding section may perhaps be better understood with the aid of a simple illustration. Assume the case of a telephone company that has but one source of revenue—from single party service at $2 a month, or $24 a year. If there are 1,000 subscribers the gross annual revenue of the company will amount to $24,000 a year.

To simplify the illustration we will assume that there is no funded indebtedness, and that the operating expenses are $14,000 a year. This will give an operating revenue of $24,000 less $14,000, or $10,000 a year.

We may further assume that an appraisal has been made of the plant, and that the reproduction cost of the physical property, including the collateral cost, is found to be $75,000. As pointed out in the last chapter, an allowance must be made for depreciation. If we assume the annual depreciation rate to be approximately the same as that determined in the illustration of the preceding chapter, the annual amount to be deducted from revenue to provide for the annual depreciation will be approximately 7½ per cent of $75,000—the reproduction cost of the physical property—or $5,625. This will serve as a further deduction from the operating revenue, and the net revenue will be $4,375.

Courts and commissions have almost universally agreed that any operating telephone company is entitled to earn a return not only on its investments in physical property but also on the business value. If we assume the business value in the case under consideration to be $25,000 (this $25,000 would include the cost of franchises, cost of financing and the cost of establishing the business) we will have a total reproduction cost of the physical property, and the attached business of $100,000.

Return on Investment.—Right here the question may arise in the reader's mind as to why reproduction cost is used as a basis for determining a fair return instead of present, or depreciated value. Obviously, any business concern is entitled to earn a fair return on its investment, and the investment in the case under consideration is gauged by the reproduction cost of the property and its attached business. The fact that the property is constantly depreciating in value, and that its real value is always less than the reproduction cost, is recognized in that we are making a deduction from the earnings to set up a depreciation reserve fund.

If the net earnings amount to $4,375, and the reproduction cost of the physical property and the attached business amounts to $100,000 apparently the company is earning only 4,375 per cent on its investment. Obviously, the patient is sick; it only remains to carefully diagnose the case and find out just where the trouble lies.

Anyone at all familiar with modern business will realize that the stockholders of any company are entitled to at least 6 per cent on their investment. People who have money to lend can invest in first mortgages, and sometimes in bonds, and be assured of a return of from 5 to 6 per cent on their investment. Obviously, a stock investment in any business enterprise is more hazardous than a bond or mortgage investment, and therefore the investors should be assured of at least as large a return as they can obtain from safer investments.

Considerations Affecting Net Earnings.—If we assume 8 per cent to be a fair return on the stock of a public utility company, the company cited in our illustration should have an annual net earning of at least $8,000. What, then, is the trouble? Those who are not already versed in rate making problems will at once answer, "The rates are too low." However, this is not necessarily the case.

It may be that the capitalization is too high; that the reproduction cost, as represented by the appraised value of the property and business, is less than $100,000. If such were the case it will be obvious that the net earnings would be affected in two ways: In the first place, the amount to be set aside in depreciation reserve would be excessive, and in the second place, a reduction in the capitalization would necessarily result in a higher return on the investment. For instance, if the value of the property were $50,000 instead of $100,000, the $4,375 net earning would show a return of over 8 per cent instead of slightly over 4 per cent.

Again, it may be that the operating expenses—in this case, $14,000—are excessive. If a careful analysis of these two factors does not disclose the trouble it may be well to investigate the annual rate of depreciation. From the foregoing chapter the reader will readily realize that false assumptions as to the life or the salvage values of any of the component elements of a telephone property may result in an annual rate of depreciation which is too high or too low, as the case may be.

Without going into detail it seems probable that the reproduction cost assumed in the illustration is a little high. There are only 1,000 subscribers, and a valuation of $75,000 for the physical property and $100,000 for the total property and business would mean a reproduction cost of $75 and $100, respectively, per station. Probably such a plant, adequate to serve 1,000 subscribers would not average $50 per station for the physical property, and, say, $60 to $70 per station for the total reproduction cost, including the business. All of the foregoing items should be carefully considered before jumping at the conclusion that the rates are too low.

Before taking up the more complicated problem of rate-making the five factors already mentioned will be considered a little more in detail.

Valuation.—It is hardly necessary to dwell at length on the question of valuation. This phase of the subject has been discussed in considerable detail in the other chapters. It is sufficient to say that any rate investigation must be predicated upon a careful determination of the reproduction cost of both the physical property and the so-called intangible assets of a company.

Such a reproduction cost can only be obtained by first making a careful inventory of the physical property and then appraising this inventory with the aid of such unit costs as may be deemed fair at the date of the appraisal, and finally by adding an adequate allowance for the collateral costs and intangible values.

In considering the question of valuation every effort should be made to ascertain whether the plant under appraisement is suitable for the purpose for which it is being used. In the illustration cited in the preceding section, the statement is made that a plant serving 1,000 subscribers would average about $50 a station for the reproduction cost of the physical property. Obviously, a plant with so low a reproduction cost per station would have to be composed largely of open wire, and the subscribers would have to be close enough together to eliminate long runs.

A condition might exist where, although $50 a station represented a fair reproduction cost valuation of the plant under consideration, it would be advisable to replace portions of the wire plant by aerial cable, and perhaps even to build a small amount of underground plant.

In such a case it may be argued—and rightly so—that rates based upon a reproduction cost valuation of the property, as it stands at the date of appraisal, would be entirely too low. The owners may contend that the contemplated improvements would so increase the investment that rates based upon a valuation of $50 per station would be inadequate to permit them to properly maintain the plant, furnish good service, and still earn a fair return on their investment.

Lay Telephone Cable Beneath the Missouri River

A submarine cable has been laid across the Missouri river between Sioux City, Iowa, and South Sioux City, Neb. It is the first underwater cable to span the Missouri river and will replace two aerial cables extending over the combination bridge.

Preventive and Corrective

By D. C. HOSFELD

Plant Result Engineer, American Telephone & Telegraph Company

(Continued from May issue.)

Open Wire Maintenance

Where any considerable amount of open wire is in service, its maintenance becomes an important problem. Iron wire has a limited life in many sections of the country and, under certain conditions, deteriorates rapidly. When new, its transmission characteristics are satisfactory but, as deterioration sets in, transmission losses rapidly come into the picture. In many localities, particularly along the sea coast, copper wire is now being used almost exclusively. Even copper wire may have its faults, as failure to thoroughly clean the wire before splicing with a sleeve, or making a hand joint instead of using a sleeve, often leads to trouble, due to high resistances.

Excessive slack or excessive tension, both cause trouble, and probably more is due to lack of sufficient sag than to an excess of it. With excessive sag, wires become crossed but when sufficient sag has not been allowed, cloth weather is almost sure to bring in trouble due to broken wires. In most areas, the temperature ranges are such that wires put up with the proper amount of sag will cause little trouble in summer due to crosses and very little in winter due to breakage. Standards have been set for the proper sag under varying conditions and it is now measured either by means of slack gauges or by means of the oscillation test.

Underground cable in conduit is the most trouble-free type of plant. Given a good initial job of construction, with particular reference to splicing and solder work, few failures occur. With aerial cable, the problem is more involved. Its sheath is exposed to damage and when breaks occur troubles due to moisture soon develop.

Expansion and contraction are a common source of sheath breaks when the cable messenger is too tight. The messenger, when placed under high tension, cannot contract and expand under varying temperature conditions to the same extent as the cable which it supports and this often results in cable bows. Further contraction and expansion soon breaks the sheath. Studies of this condition have indicated that such troubles may be materially reduced by allowing sufficient sag in the messenger.

Separation a Preventive of Electrical Trouble

Electrical hazards are another common source of trouble. Many troubles which appear to be due to lightning are, on further analysis found to be the result of lack of adequate clearance between power wires and the telephone cable or wire plant. With normal voltages on the power wires, no damage occurs, but when a high voltage due to lightning is impressed on either plant, a spark is liable to pass between them, forming a low resistance path over which the power current may flow. Such a "power arc follow-up" usually causes serious cable burns. The solution, of course, is to keep power and telephone plant properly separated and constant vigilance is necessary to accomplish this. Some trouble is encountered due to lightning only, but adequate air-gap protection at cable terminals usually restrict such trouble to a small amount.

The standards of outside plant maintenance should be adequate for present day service requirements and entirely consistent with those set up for other classes of plant. From the subscribers' viewpoint, a loose connection in a cable terminal is just as important as a loose connection on a main frame and should receive equal attention. We hear a great deal about inspections of soldering on the main frames, but nowhere near so much about inspections of lock-nut connections in terminals. A broken pole is a much more serious matter than a frayed cord, but the routines for detecting and correcting central office defects generally seem to receive more attention than those for outside plant. From a strictly dollars-and-cents standpoint, the performance as to different types of plant should always be in balance. We may readily find cases where the troubles that cost most to clear are those that we take the least care to prevent.

Continuous preventive maintenance on outside plant is necessary to preserve the integrity of the service and the investment. Like any other type of preventive maintenance, it involves periodic inspections on a programmed basis, along with prompt and permanent repairs. Unless this is done, plant originally well constructed will gradually deteriorate. For instance, minor additions to the plant may frequently be made in a non-standard manner, perhaps because of time elements involved or because the workmen did not have the necessary material. Such work, considered as temporary, may be allowed to become a permanent part of the plant. Outside interference, in the form of trees, other company's plant, etc., may creep in without the knowledge of the telephone forces and without proper corrective measures being taken. Connections in cable boxes become defective, cable rings slip or rust, the cable creeps, splices are left unsupported, sheath openings covered by tape as a temporary measure may be left in plant for long periods, and underground cables may be left unracked or improperly supported.

If the outside plant maintenance is confined to the clearing of reported troubles, progressive deterioration is inevitable and the gradual accumulation of defects over a period of time may result in a condition requiring wholesale replacements.

Station and P. B. X. Equipment

Subscribers' station and private branch exchange equipment is the source of more than half of the troubles on subscribers' lines. While some of these troubles are minor in nature, they interfere with the subscribers' service and, from that standpoint, require constant attention.

Undoubtedly, the character of the initial installation job largely determines the station's susceptibility to trouble and a little extra effort on the part of the installer may result in decided ultimate economy and better service. This is brought home rather forcibly by the fact that the labor of making two trouble trips is just about equal to the labor of making an entire new installation.

One of the greatest opportunities for improving conditions at existing stations seem to lie in having the repairmen make a complete and thorough inspection of each station which he visits in connection with clearing a reported trouble. While this plan cannot be rigidly complied with during peak trouble loads, such as may occur during storm periods, it should, if applied only when conditions are normal, result in a high percentage of the stations being given preventive maintenance treatment each year.

Where local battery stations are in use, the maintenance of the dry cells becomes an important factor. Subscribers differ in the amount of usage of their station and the life of dry cells is proportionately varied. Periodic wholesale replacements have been tried

and while they are quite satisfactory for those stations having an average or below average calling rate, they do not successfully take care of those stations having high usage or excessive "listening" time. Another plan which has been more successful, as well as economical, has been to record each time the batteries at a station were changed and then after a suitable interval to periodically call the subscriber to determine if transmission from his station is still at a satisfactory level. This may appear to be a large job but by approaching it on the basis of a few stations each day, the time required during any one day is relatively small. In this way, those stations having run down cells are detected before service is appreciably affected. The operators have often been of assistance in making these test calls. The improved type of dry battery recently developed, having a longer life, is expected to materially reduce the volume of battery replacements.

Particularly in the larger cities, an increasing number of stations are being given service through Private Branch Exchanges. That this is a problem of large proportions is shown by the fact that in the Bell System there are now about 125,000 P. B. X. switchboards serving about 2,600,000 stations, and in the larger cities, about one-fourth of all calls pass through this equipment. In reality, Private Branch Exchanges are small switchboards widely distributed and require much the same type of maintenance that is given central office equipment.

Transmission tests and detail equipment inspections of these boards have generally shown that more numerous trouble conditions exist than would be indicated by the trouble reports received. The fact that this equipment is operated by individuals not directly under the telephone company's supervision, and who are frequently not in a position, and perhaps not trained, to detect all trouble conditions, makes it essential that special attention be given to this equipment.

Preventive maintenance takes the form of complete periodic inspection and tests, including transmission tests. In addition to these thorough tests and inspections, it is desirable to visit all switchboards regularly at more frequent intervals for the purpose of making such repairs as polishing plugs, repair cords and attendant's telephone sets. This should result in better service at little, if any, increase in costs.

Repair Service Desks and Test Desks

One of the most valuable aids in directing and supervising exchange maintenance is an adequate set of records. Usually these records take the form of a card for each subscriber's line or station on which is recorded complete data regarding location and facilities used, as well as a detail record of each trouble reported, the faults found and work done. In addition to the record of trouble on the subscriber's line card, a periodic summary by classes of trouble is usually made so as to get a general overall picture of the situation.

Receiving trouble reports from the subscriber is an opportunity for leaving a favorable impression with him. Because such contact occurs at a time when his service is not all that he thinks it should be, it is important that our attitude be friendly and courteous and our action on the report prompt and effective. In the larger offices, these calls to report trouble are routed to a Repair Service Desk, generally operated by women selected for the position because of their experience and ability to handle properly the varied situations which arise. Trouble reports are recorded directly on the line cards and forwarded immediately to the test desk man. In the medium sized offices, where a Repair Service Clerk cannot be economically employed, these reports are often received by the tester, while in the small offices where plant forces are not always on duty, the reports are commonly received by the operating force.

Once the report has been received and recorded the line is tested to determine the cause of the report. With the many classes of service and the varied forms of equipment to meet the subscribers' needs, this is frequently no easy job.

On the quality of the work done at the test desk largely depends the effectiveness of the corrective maintenance work. If the tests are made thoroughly; if the trouble report is analyzed carefully in the light of past reports and the possibilities for trouble not readily detected from the test desk, very satisfactory results will be obtained. If, however, tests are made hurriedly and only cursory analyses made for troubles not obvious from the test, there will result a high proportion of test O. K.'s and probably many repeated reports. In the interests of good service, it is desirable to send repairmen on many reports on which no trouble indication can be obtained from the test desk, as frequently unsatisfactory conditions will be discovered which are responsible for the report.

Generally it has been found desirable to test with both repairmen and installers on the completion of their work. While there are many items which the repairmen or installers can test for themselves, certain faults such as high resistance grounds or crosses, excess capacity and similar defects cannot be detected readily, except by the equipment provided in the test desk. There is also the human factor involved. All of us are liable to overlook certain obvious things and a final check with the test desk man will bring many of these to light.

In addition to testing in connection with trouble reports and installations, the test desk man may assist in work of a preventive maintenance nature. It is well known that there are always some troubles in the plant which have not been reported and also conditions which, if allowed to remain, would eventually result in troubles. Periodic voltmeter tests of subscribers' lines and, in machine ringing or dial areas, also breakdown tests, will do much to disclose these faults. These tests are made during both dry and wet weather and the latter have been particularly helpful in bringing about a general improvement in plant conditions.

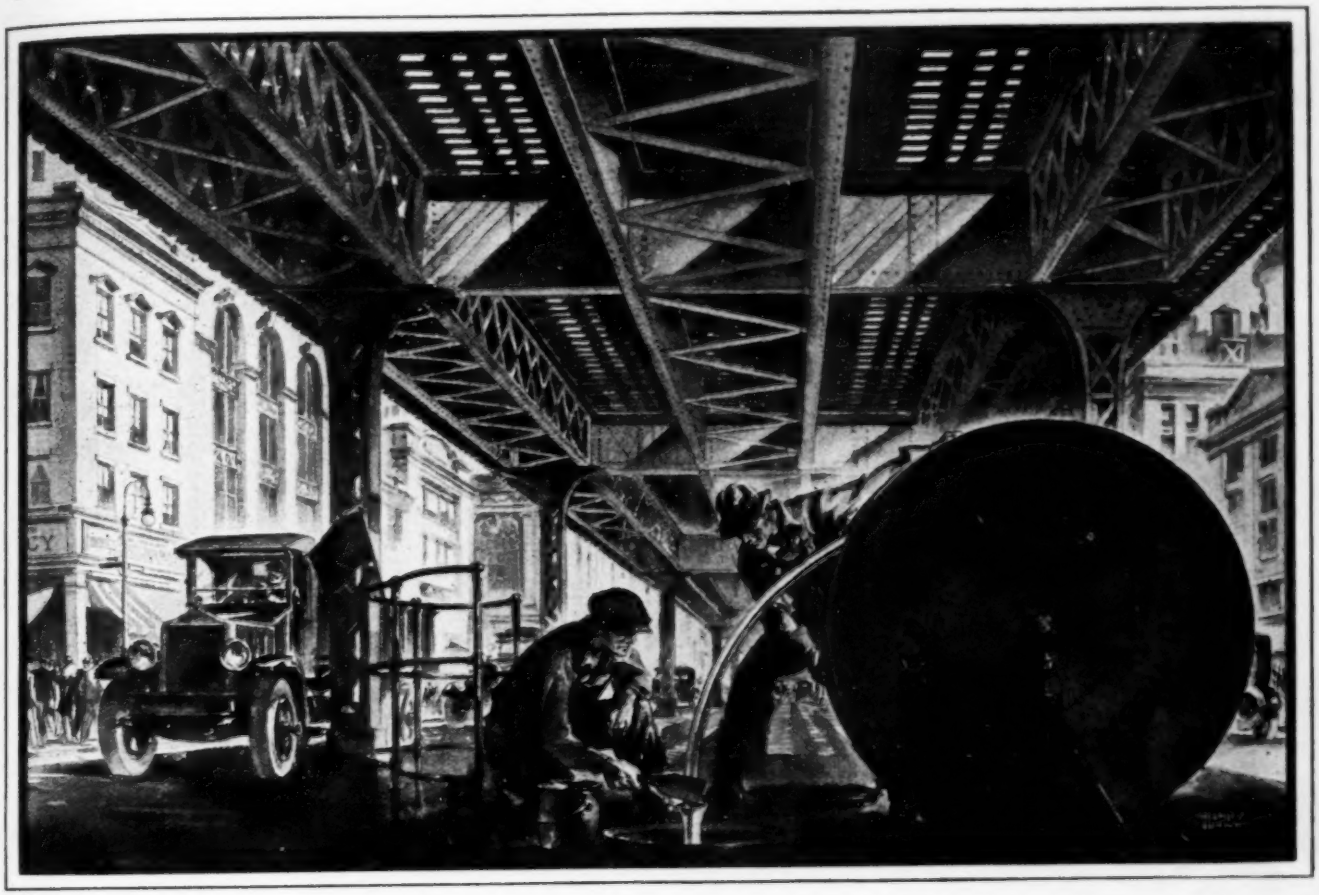
Low Insulation Indicates Future Trouble

Troubles nearly always increase during wet weather. Along with the actual troubles, there are usually many lines on which the insulation is much poorer than during fair weather and this condition gradually grows worse until it interferes with service. Trees growing into open wire, abrasions on covered wire, leaky cable terminals, damp inside wiring, etc., all combine to be a menacing source of future trouble. These potential troubles are generally disclosed by tests made during wet weather and while they probably cannot all be cleared at once, if adequate records are kept of the faults discovered and these repaired within a reasonable period, troubles during adverse weather conditions may be materially lessened.

Toll Plant Maintenance

In the last few years a number of factors have combined to direct increasing attention to the toll plant. The rapid increase in toll business has been accompanied by an equally rapid expansion of the plant, particularly the cable plant, and a much more extensive use of telephone repeaters and carrier systems.

Along with this expansion of business and plant, there have been other important developments which require that the toll service shall be maintained substantially free from interruptions. The high speed toll service given by the combined line and recording method of operation is only possible with an adequate number of circuits constantly available. The requirements for a very high grade of



1800 conversations at once through a cable less than 3 inches thick

An Advertisement of the
American Telephone and Telegraph Company

The earth beneath our great cities is crowded. Steam, gas, sewer and water-mains, compressed air pipes, pneumatic tube systems, telephone and telegraph cables, light, power and rapid transit conduits lie so close together that any further additions create serious engineering problems. Yet the number of telephone calls that must flash through the underground arteries of great cities is steadily increasing.

The challenge to the scientific minds of the Bell System was to find a way for more conversations in existing conduits. Fifteen years ago, the pride of the System was a cable containing nine hundred pairs of wires. Then by many improvements a cable of twelve hundred pairs was perfected. It was rightly considered a scientific triumph.

Today, cables containing eighteen hundred pairs of wires are in service and these cables with every wire insulated are only two and five-eighths inches in diameter, one-half as large as the first nine hundred-pair cable. Eighteen hundred conversations at once—six hundred more than before—can now pulse through this two and five-eighths inches of cable.

There is no standing still in the Bell System. Better and better telephone service at the lowest cost is the goal. Present improvements constantly going into effect are but the foundation for the greater service of the future.

"The Telephone Books Are the Directory of the Nation"

uninterrupted service on broadcasting networks is another illustration. All of these factors have increased the complexity of the plant problem in the engineering, construction and maintenance features.

Of major importance are adequate pole inspection and replacement work, carried out on a definitely programmed basis, proper storm guying, close attention to sag, and careful handling of wire by workmen so as to avoid kinks or nicks.

In the plan of preventive maintenance for toll wire, it is essential that regular and systematic patrols be included. Faulty conditions gradually accumulate and, unless these are periodically corrected, an undue amount of service interruptions is likely to ensue. Foliage interference, broken tree limbs, broken insulators, loose or broken tie wires, loose or broken pins, loose connections, broken poles and hazards from power and light lines are among the principal defects for which all toll plant should be regularly inspected.

The problem of tree interference is always present. This not only refers to contact of open wire with foliage and branches but also the hazard of trees falling into the line during storms. Tree foliage causes low insulation which, in turn, may result in transmission losses, excessive crosstalk, or interference with the operation of telephone repeaters, carrier or telegraph equipment.

The use of toll cable has been growing rapidly and in this we have a new major factor in toll maintenance. Service failures on aerial wire plant, except in cases of casualties such as storms, fires or floods usually involve only a few circuits. Although cable will withstand storms or floods much better than aerial wire it is more susceptible to complete failures due to everyday causes such as sheath breaks, holes, etc.

The importance of careful workmanship in the construction and maintenance of the toll plant can hardly be overstated. If a line is well designed and well constructed and maintained, a minimum amount of trouble will follow. But, if wires are not cleaned before splicing, if a wrong amount of sag is left in wires or cables, if poles are set too shallow and insufficiently guyed or braced, if cable splices are carelessly made and so on—service failures are bound to follow. Service interruptions caused by workmen are also an outstanding source of trouble.

Only a few years ago only one conversation at a time could be carried on over a single circuit and if trouble occurred only one conversation was interrupted. With the introduction of the phantom circuit and the more recent carrier systems, it is now possible to carry on simultaneously over two circuits as many as nine separate telephone conversations, as well as operate eight telegraph circuits. The seriousness of interruptions on circuits of this nature is, of course, plain.

Transmission Maintenance

Transmission is the commodity which all telephone companies sell. In the last few years the increase in very long haul telephone calls has directed special attention to the maintenance of the plant from a transmission standpoint. Not only has there been a marked increase in long haul traffic within the United States and Canada but lines have been opened to Cuba, Mexico, England and Continental Europe. When it is remembered that almost any Bell Telephone may be used for such connections, it becomes evident that if the service is to be a success all of the plant involved must function perfectly. A noisy line, a defective cord, a loose connection or a wornout battery may be the one hindrance to a successful call.

The question is asked as to why transmission maintenance should be made a separate feature of the maintenance work. The answer is just this: Transmission is so important that in order to give it proper emphasis, so that adequate attention will be continuously devoted to it, it is necessary to set up a separate check that will bring into the picture data as to overall results and conditions on all the various combinations of talking paths, both exchange and toll.

It is true that most of the phases of the maintenance job which we have just discussed have a profound effect upon transmission but they alone may not insure perfect operation. Most of the maintenance tests are made by means of apparatus employing direct current and these do not always reflect the faults which may be detected by use of transmission measuring sets employing voice frequency currents. Crossed windings in coils or relays, equipment unbalances, and magnetized cores are examples of this nature.

Periodic transmission tests of nearly all circuits in the central office, of P. B. X. switchboards, and of toll circuits have come to be regarded as essential. By such tests, practically all faults causing transmission losses will be disclosed and, in addition to those faults which should be detected readily by the usual maintenance tests, obscure troubles not otherwise found will be discovered.

There appears to be a necessity for developing a more thorough understanding among the maintenance forces of the features of their regular work in which transmission maintenance is particularly concerned, and to accomplish this end, diligent training of the plant forces is required. The supervisors of this group will also need a working knowledge of transmission features, in order that intelligent supervision may be given. During recent years, there have been few undertakings which have contributed more toward the production of good service than the special attention given to transmission maintenance.

Selection and Training of Personnel

Aside from the training necessary in connection with transmission maintenance, any discussion of maintenance problems in general would not be complete without mention of the selection and training of personnel.

The complexity of present day equipment and high service standards requires maintenance men of better than average intelligence, of a technical and practical turn of mind, and of considerable manual dexterity. Maintenance is not a machine product and the human element is the most important factor.

Because of the complexity of modern equipments, considerable training effort must be expended on new employees to prepare them for productive work. This initial training may be given in a plant school or by the apprenticeship method of associating the new man with a skilled man who is known to be an effective teacher.

The selection of supervisors should generally be made from the working forces, as the opportunity for promotion is one of the big rewards which spur men on to greater accomplishment. The supervisors must be impressed with the importance of currently assuring themselves that good quality and reasonable production is being given by each individual in their groups, and of continually appraising the individuals' limitations and possibilities. They must be trained to avoid accepting anything at face value, without due investigation of the facts, and last, but not least, they must not only be leaders but thinkers.

Remodel Telephone Company

Cabool, Mo.—The Ozark Central Telephone Company will start work soon on remodeling its system in Cabool. Practically all lines will be in cables and the lines will be placed in the alleys instead of on the streets. A new switchboard will be installed at the telephone office and the entire building will be remodeled and used as a central office.

Northern White Cedar Poles

Northern White Cedar Poles in lines of Chicago Telephone Co., on Wentworth Ave., south from 61st St. Set in 1899.

Far in the Lead!

THERE are more Northern White Cedar Poles in use in telephone lines than any other kind.

What greater proof could there be that Northern White Cedar poles are proving most efficient, satisfactory and economical?

The same happy combination of advantages that made Northern White Cedar the "original" pole timber is still the standard comparison for all telephone poles.

Among those advantages are light weight, strength, good appearance, proper taper, and long life. At any time during the life of Northern White Cedar Poles, you can cut gains and install new cross arms without exposing poles to decay.

Northern White Cedar Association

Minneapolis - Minnesota

Time-Tested – Why Experiment?

LINE AND DESK

STICKING TO OLD METHODS IS SOMETIMES A CAUSE OF LOSS

The man who uses old methods and old ways all the time does not meet much opposition but just let him try something new and then the fun starts. Most people would rather be a leader in an old method than a follower in something new, even though they may know that the new way is the better.

I remember the first time that trying to be modern got me in bad. I was spending the summer on my grandfather's farm in Iowa. He was using a very inconvenient bolt and chain arrangement to fasten the gate on the cow lot. One afternoon when everyone was away I constructed a neat latch arrangement out of a couple of pieces of strap iron and some bolts. This worked very well and I expected to be complimented highly but was due for disappointment. That night grandfather put back the chain and informed me that I was to remove the new latch first thing in the morning. I attempted to argue but he simply said that with the chain the cows had never got the gate open and he didn't know but what they might with my latch.

At the present time there are many new developments in tools, material and equipment for the telephone business that would save money for many companies but tradition keeps them from use. The men in charge know what the old will do and they will not believe that the new is all that it is claimed. They don't care to risk trying it just as grandfather would not risk the latch on the cow lot gate.

Recently I tried to argue a man into using patent anchors on a construction job instead of the old-fashioned log. He could not see my argument as he did not trust the new type and he knew the log would hold. Also he believed the log was cheapest. He would not consider the anchors in place and compare the cost. To him the cost of material and not the completed unit was all that could be considered.

I have known of many cases where telephone companies refused to consider the replacement of central office equipment because it was in good condition and giving good service. Many times a careful study of new equipment and the saving in cost of operation over a certain period as compared to the cost of operation of an obsolete type will prove that it is cheaper to throw away the old rather than to keep it in service even though it is in good condition.—Contributed by Ray Blain.

THE SUPERVISORY JOB CALLS FOR PLANNING

Just talking about it won't do it. Plan the work, then work the plan. See that every man who has a job to do does it.

Systematize, organize, supervise.

Those words pretty well cover the task at hand; however, the big thing is to do just that. When one sees the building of new structures, when hammers, concrete mixers, coils of copper, and reels of cable flash and turn, the occasion is not one to ask the supervisor his opinion of the difference between the seashore and the mountains as a summer playground. It is absurd to suppose that he can be separated from that which he is doing. The supervisor builds the entire job in his mind, he plans the work for the key men. He picks the key men from the rank and file of the working organization. He trains them, in their present positions, to be able to hold more important positions, and then trains another to follow each key man. This requires an endless chain, so to speak, of training of men. From these men, line foremen are picked and another branch is started.

With a job scattered over a large area, work must be planned so that your foremen are located in close proximity to whatever happens. This must be forecasted by the "boss." He must be able to place a crew of men on an emergency job on short notice, with a minimum amount of lost motion. The supervisor sees the unfinished job, as well as the finished job, in his mind. He directs the men at long range by his knowledge of the conditions at that location. He has what might be termed an "all seeing eye." He depends on his foreman to do the job, but the foreman keeps his "boss" posted at all times as to just what the actual conditions are. For this reason all leaders are picked as their qualifications prove them capable.

The organization must be so set up that any part can be separated from the rest and not weaken the structure. The labor turnover must be given close attention, else production will be affected and labor costs will become excessive.

Accident prevention is an important factor. This is a real study for the supervisor, as well as for all line foremen. Group meetings are held at advantageous times, and safety talks are given the workmen. Safety bulletins are provided and points discussed with the men.

First Aid work also is an important factor. This is very important to the men who are located at distant points in the district where medical attention would be delayed on account of distance from doctors.

It is a 24-hour a day job keeping your hand on the pulse of a working organization scattered over a large area.—Charles Chandler in The Michigan Bell.

TELEPHONE FACILITIES IN LARGE OFFICE BUILDINGS

The enormous amount of telephone plant required to serve a modern office building in a large city is shown by figures recently given by W. R. Meins in Bell Telephone News. The office building cited is the Insurance Exchange building in Chicago which is said to be the fourth largest office building in the world. It is twenty-two stories high and covers an entire city block. There are 1,118,000 feet of rentable office space and when the space is all filled the building will house a population of 14,000 men and women, a small city in itself.

Following is a summary of the facilities provided in this building:

12,000 feet of steel conduit.

125 metal distributing boxes.

715 cross-connecting boxes.

1—16,564 pr. main distributing frame.

39,650 lineal feet of 7.5 miles of various sizes of cable.

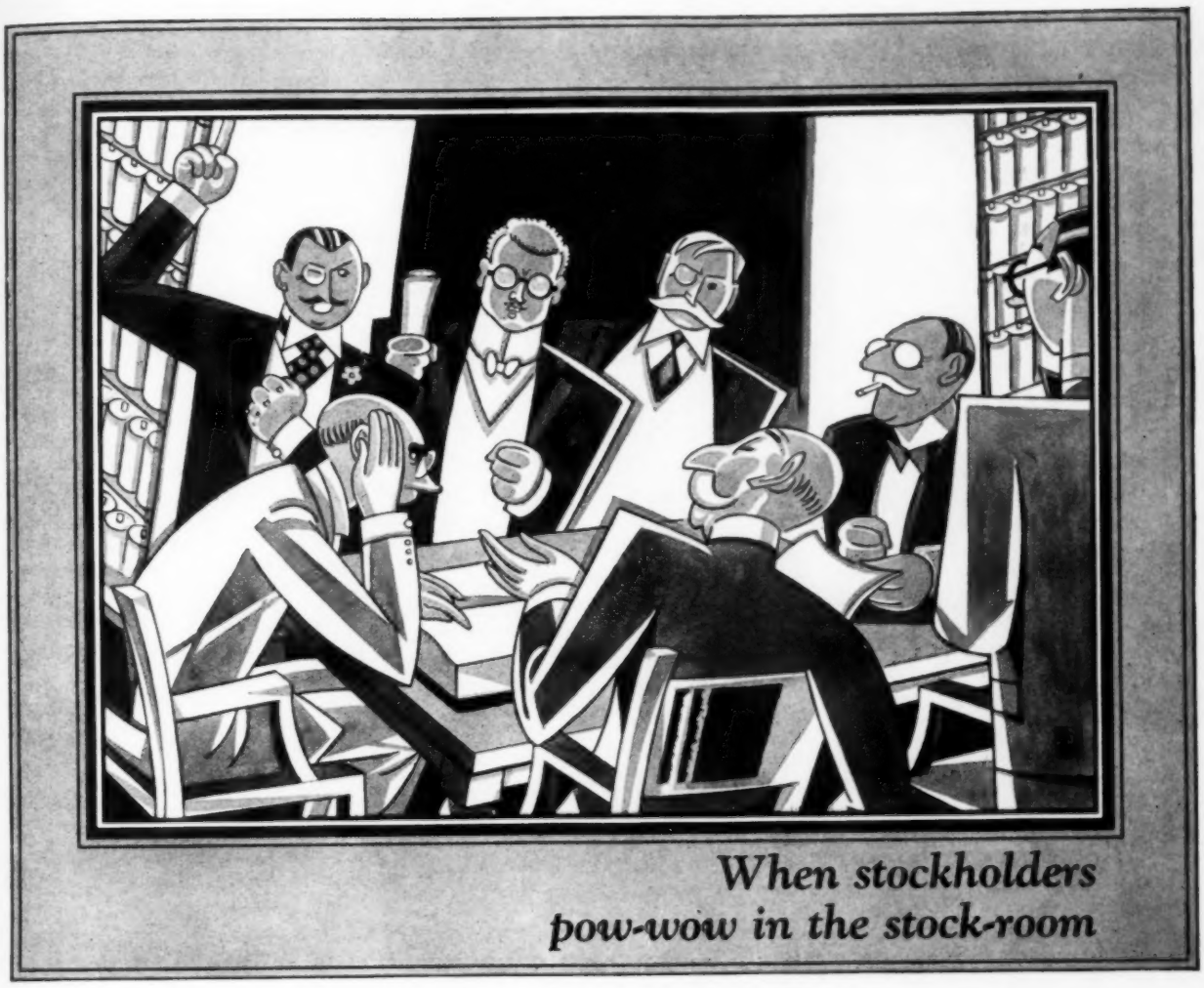
1,389 miles of wire in building cable.

3,000 miles of wire in underground cable.

210 P. B. X. switchboards.

There are at present three 1818 pair underground cables connecting the building with the central office. Of these 5,454 pairs, 3,636 are terminated direct to the basement distributing frame.

In the building eight riser shafts are provided with a total of 11,211 cable pairs distributed, of which 1,818 pairs are spliced direct to the floor terminals and 9,393 pairs terminated on the main frame in the basement. The riser cables are stubbed on each floor and pairs terminated in the floor cross-connecting



When stockholders pow-wow in the stock-room

WASTE in stock-room makes bad medicine for stockholders' dividends. Columbia Gray Label Telephone Dry Cells waiting in stock-rooms conserve stockholders' investments. Inaction does not deplete their power because they contain no impure elements to produce wasteful internal circuits. These cells retain active life ready to jump into action at any instant. Increase telephone dividends by standardizing on Columbia Gray Label Telephone Cells.

NATIONAL CARBON COMPANY, INC.
New York Chicago San Francisco
Atlanta UCC Kansas City
Unit of Union Carbide and Carbon Corporation

Columbia
Telephone Batteries
Best by test–they last longer

terminals. The building cabling forces can rightfully be proud of the job just completed in this building. Let us also record the fact that 345 splices were made indicating very clearly the magnitude of the job.

There are at present 2,810 pairs in use in the building, and it is estimated that by the end of this year there will be approximately 3,600 main lines working.

FIRST CARRIER LOADED SUBMARINE CABLE IS LAID IN LOUISIANA

It was desired to operate carrier current circuits through this cable to the LaPlace repeater station and since a length of approximately 5,000 feet of submarine cable was required and the normal spacing of carrier loading coils is 929 feet, it was evident that some method other than any previously used would be necessary to take care of the situation. Special low capacity single armored cable, and special submarine loading coils and cases were designed to fit the conditions. The cable contains three quads 13, 19 quads 16, 24 quads 19 and one quad 22 gauge conductors. The 13-gauge quads are individually shielded and make up the core. The 16 and 19-gauge quads make up the first and second layers and a metal screen separates the two layers.

The cable was designed with a very loose core, using "spiral four" construction for forming the quads obtained. On this basis it was estimated that the spacing of loading coils could be increased to 1,250 feet, which would necessitate three load points in the river.

As no submarine carrier loading had been installed before, it was necessary to design new loading coils which would have the same electrical characteristics as coils used on the land cable, and occupy as little space as possible, also to design a submarine loading case to hold them.

As it was thought that the pots, sinking faster than the cable, would buckle the armor at the point where it entered them it was agreed to use pontoons attached to the pots and thus confine their descent to about the same speed as the cable itself.

The pontoons were equipped with a trigger arrangement, to be operated by means of a long line after the pontoons and pots reached the bottom of the river. The trip lines were fastened to barrels to serve as buoys so that the triggers would not have to be operated from the cable barge but a tug could be sent back to release the pontoons.

Two tugs were used to hold the barge against the current and to work it slowly across the river. The first pot, which was to be located in about five feet of water, had not been rigged to a pontoon but had been placed on a small barge and floated close to the shore and was in position when the start was made.

The second section of cable was paid out and the pontoon and pot cast loose from the barge at 3:45 and the third at 4 p. m. The opposite shore was reached about 4:15 p. m.

After tying up the barge a tug was immediately started back to trip the pontoons and bring them back to the barge.

When the pontoons came to the surface it was found that the pressure of the water together with the crushing pressure of the chains from which the pots were suspended had collapsed them. —F. R. Adams in Southern Telephone News.

New San Marcos Exchange Equipment Recalls Pioneer Telephone Days

Early days of the independent telephone industry were recalled by the old residents of San Marcos, Texas, on Friday, December 28, 1929, when the San Marcos Telephone Company held open house to celebrate cut-over of their new Kellogg equipment, the installation of which had just been completed.

An entirely new and complete exchange was built by the company to take the place of the former central offices which was no longer suitable. The building is of modified Spanish type which is particularly suited to the locality. It is sturdily built with an attractive stucco exterior and a Spanish tile roof.

Inside the building everything has been provided for the efficiency and comfort of the employes. The manager's and cashier's office is roomy and complete in every sense, as Mr. Merton Swift, who is the manager of the exchange, is one who believes in light and air and plenty of room for efficient work. In the picture of the office a complete filing system can be seen. With this modern equipment, Mr. Swift is able to put his finger in a moment upon any data that could be wished for on the operation of the exchange.

The switchboard room is light and airy. It is comfortably large for the six position Kellogg full feature service switchboard which together with the chief operator's desk occupies this space.

The operators' rest room is comfortable and nothing which would add to its attractiveness has been left undone.

The acquisition of the new equipment took place almost exactly thirty years after the founding of the original exchange in 1899 by Mr. T. R. Durrett. Since that time the San Marcos Telephone Company, like a great many others, has had a varied career. An interesting reminder of those pioneer days is the first telephone directory issued by the company in 1899. It consists of a single card containing sixty names and numbers. The rules and regulations, which make up the rest of this antique telephone directory, will be amusing and reminiscent to old-timers in pioneer telephony.

Soon after Mr. Durrett sold the exchange, the San Marcos Telephone Company fell into the hands of speculators who at that time made a practice of buying and selling controlling interests in independent telephone companies for profit. Of course, during the operations, the exchange was left to itself and the equipment was allowed to run down.

In 1910 the equipment and the finances of the company were in poor shape. The only asset the company still had was the good will of the community which it served.

Mr. Merton Swift, the present Manager of the exchange, in 1910, decided to return to San Marcos, which was his original home, and organize a company to take over the telephone exchange. After a few years of profitless operation, due to low rates, the company received a permit for equitable rates, and in turn, promised the citizens of San Marcos adequate, continuous, and good telephone service.

This promise has been kept and the new Kellogg full feature service switchboard, which occupies the position of honor in the beautiful new telephone exchange building, will serve the community for many years to come.

Establish Wireless Telephone in Peru

Permission to establish wireless telephone and wireless telegraph stations in Peru for point-to-point and international communications was granted All America Cables, Inc., in a concession signed by President Leguia and announced June 1st. The concession renews the company's previous rights.

Under the terms of the concession, All America Cables also is granted the right to establish submarine cables for international telephone transmissions, as well as to continue to use its submarine cables for transmission and reception of telegraph messages as it does at present. It is specifically stated that all or part of the lines that exist today, or which may be laid in the future, may be used for telegraph and telephone communications or simultaneously for both.

The concession stipulates that within two years All America Cables must erect the stations necessary for wireless telegraph communications to the United States, Spain, Argentina, Chile and Central America, and for wireless telephone communications to Spain with connections to other parts of Europe and to Argentina, Chile and the United States.

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WORKMEN'S COMPENSATION AUTOMOBILE

New York Telephone Conditions Very Satisfactory as Shown by Reports to the Annual Convention

The annual report of President J. G. Ihmsen to the New York Telephone Association at its annual convention at Rochester, May 22, 23 and 24, is very interesting in that it shows conditions in that state very satisfactory. Only a few telephone companies changed hands during the year, and an increase in the number of stations owned by Independent companies in the state was above 10,000.

Following extracts from Mr. Ihmsen's report shows a healthy condition in that state.

"Your association has passed through another successful season, during which time it served member and non-member telephone companies in practically every portion of the up-state territory.

Your member companies as a whole have been prosperous during the past year. The companies reporting regularly show an increase in number of telephone subscribers and a net gain in revenue. Two hundred and ten member companies reported a net increase in subscriber stations of 11,777.

There was not a great deal of activity in the sale of telephone properties during the year. Our record shows only eight transactions since my report at the 1928 convention.

Five additional telephone properties were brought under commission jurisdiction. They are the Susquehanna Valley Telephone Company, Harpursville; Caroline Farmers Telephone Company, Slatersville Springs; Otselic Valley Telephone Company, Cincinnatus; North Country T. & T. Company, Evans Mills, and the Big Eddy Telephone Company, Narrowsburg.

The matter of transmission is of great importance and it is probable that your association will continue the pressure this year on correcting transmission losses, from a practical plant standpoint.

We have become accustomed to saying that the only thing telephone companies have to sell is service. I made that statement recently at a telephone meeting, and one of the engineers present—I think he was a transmission engineer—took issue with my position and argues that the only thing a telephone company has to sell is transmission.

I was willing to admit that transmission is one of the most essential branches of the service, and while it is not specifically mentioned in the contract, it is there by implication. Without good transmission there cannot be good service, and without any transmission there would be no service at all, thus establishing its importance as a factor.

I have never been able, however, to disassociate transmission and service. The word service in its broadest application couples the personnel of every department into a capable unit, moving in harmony to the end that the best possible service may be rendered; and I still maintain that a 100 per cent good transmission would be of no avail, if the other departments failed to function properly.

Now just where does this thought lead us? Why are we giving so much attention to transmission at this time? If I may venture an opinion, I would suggest that it is largely because, as far back as I can remember, we have been driving on plant, commercial and accounting.

The cumulative effect of those efforts has been a decided improvement in all of those departments. They have progressed, while transmission as a separate study was neglected, and lagged behind other departments.

The increasing popularity of long distance service and more extensive use of toll circuits brought us to a realization that transmission of a few years ago is inadequate today. Something had to be done and we are now doing it. Primarily an engineering problem in its technical aspect, the engineers have done more to develop and refine the art of transmission in the past few years than ever before within my recollection.

Instrumentalities have been improved and perfected. Modern methods of measuring transmission losses have been discovered and put into practical use. Effective methods of employing transmission tests in telephone plants are helpful in locating the source of trouble.

As a result of these accomplishments and through courtesy of the New York Telephone Company, we were in a position last season to offer practically a free transmission test to all the Independent companies in the state.

We may think that our transmission is good because there has never been a transmission test made in our plant and we have no idea how much our business and our subscribers have suffered on that account. A transmission test will show the quality of your transmission."

The election of directors resulted in the re-election of all the directors. They are: J. P. Boylan, Rochester; B. H. Brooks, Plattsburgh; F. D. Fancher, Middletown; H. W. Fluhrer, Oneonta; G. G. W. Green, Johnstown; H. H. Griswold, Phelps; J. G. Ihmsen, Albany; L. H. Jenks, Carthage; H. P. McDonough, Newark; F. C. Saunders, Wellsville; W. A. Seely, Norwich, and J. H. Wright, Jamestown.

At a meeting of the directors, the officers were re-elected as follows: J. G. Ihmsen, president and general manager; G. G. W. Green, Gloversville, secretary; Chas. M. Beattie, Rochester, treasurer, and F. H. Brookman, Rochester, assistant secretary.

Over six hundred registered at the convention, which indicates that the association is unusually active in that state.

The entire convention was given over to live subjects of interest to New York state especially, and other states in general.

I. T. & T. Subsidiary Enters Germany by Buying Berlin Plant

International Standard Electric Corporation, subsidiary of the International Telephone and Telegraph Corporation, is entering the field of the manufacturing of electrical communication apparatus in Germany by the purchase of a substantial interest in the Ferdinand Schuchardt Berlin Telephone and Telegraph Works.

It was stated yesterday that it is planned to expand this German factory in order to increase its national distribution of telephone, telegraph and radio apparatus, as well as to develop export trade. In taking this step the International Telephone and Telegraph is extending to Germany the benefit of the inventions and technical experience resulting from the world-wide system of the International Standard Electric Corporation and its associated companies.

The Ferdinand Schuchart factory, located in Berlin, is one of the oldest of the communication apparatus factories in Europe. It has kept up closely with the development of modern electrical communication and occupies a prominent position in the field.

The International Standard Electric Corporation, the principal manufacturing organization of the international system, was incorporated in 1918 under the name of the International Western Electric Company, Inc. In 1925 International Telephone and Telegraph acquired it and changed the name to its present title. The company carries on the foreign manufacturing and export operations developed since 1882 by the Western Electric Company.

Besides manufacturing electrical apparatus and equipment especially relating to telephone and radio industries, the company has carried on an extensive business as a distributor of these supplies.

International Standard Electric has factories in England, France, Belgium, Spain, Italy, Austria, Hungary, Czechoslovakia, Australia, China and Japan, with a sales organization extending throughout the world.

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A Complete and Non-technical Reference Work, covering nearly 1700 subjects arranged alphabetically, including instructions for building, operating and testing receivers, power units and radiophone equipment. Arranged for use by set builders and designers, service and repair men, dealers and salesmen, experimenters and students, set owners and operators. 871 Pages. Size 6x9". 985 Illustrations, Circuit Diagrams, Constructional Layouts and Graphic Curves. All made especially for this book. Bound in Art Buckram. Stamped in Two Colors. Price **$6.00**

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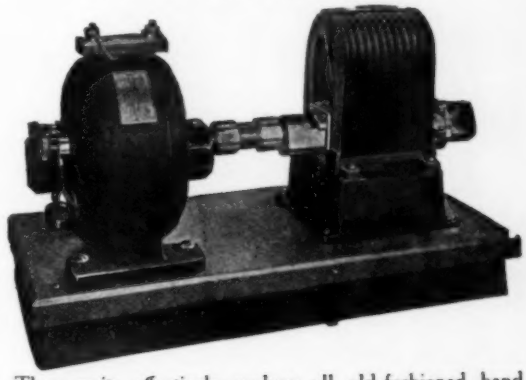

These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating expensive and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

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Indiana Registers Its Usual Good Attendance, Instructive Program, Interesting Social Features

Hoosier telephone people in record numbers gathered at the Claypool Hotel in Indianapolis on May 7, 8 and 9 for the annual convention of the Indiana Telephone Association. Through the efforts of Secretary-Manager W. H. Beck, a program of much interest was arranged and something of value was included for everyone in attendance. Exhibitors in greater than usual numbers showed the latest developments in telephone equipment and supplies.

The session opened Tuesday afternoon with a welcoming address by Mayor L. Ert Slack of Indianapolis and a response by Frank E. Bohn, president of the Home Telephone and Telegraph Co., Fort Wayne. Following these was a paper by Harry V. Wenger, chief engineer of the Public Service Commission of Indiana. Mr. Wenger gave some observations of conditions as he had found them in small telephone plants. In the rural communities, telephone service has not kept pace with improvements in other lines. The time will come when these plants have to be rehabilitated which should be done gradually. Overhead costs should be kept down and metropolitan methods need not be used to give a satisfactory grade of service in the small community. Following Mr. Wenger's paper was an active discussion on some of the problems presented in the smaller systems.

The Wednesday morning session opened with an address by F. B. MacKinnon, president of the United States Independent Telephone Association, who stressed the importance of the job of the Independent group of telephone companies in keeping up their end of the circuit. The rural problem must be solved and we must work until the solution is found. The problem is more than national for the time is coming when every telephone must be available as a terminal for world communication.

Secretary W. H. Beck of the Association then gave his annual report which was followed by the president's annual address by Henry A. Barnhart of Rochester. For years President Barnhart's surveys of Indiana telephone conditions have been features of the convention programs and this report followed the standards set in preceding years. Mr. Barnhart referred to the generally satisfactory condition of the telephone business in Indiana. There are, of course, some unfavorable conditions but wonderful progress has been made. Credit for improvement must be given to activities of telephone associations, state and district, the results of which is vastly increased telephone service efficiency and telephone business attractiveness. As a second part of his text, the speaker dealt with selling telephone servive. No telephone company has yet reached saturation in its territory and valuable suggestions were made for the sale of increased service. Rate troubles, we still have with us in some localities and higher rates can usually be obtained by showing service improvements, by publicity and by giving service which the public appreciates. Excessive taxation is becoming a burden and if more than its full share is laid on the telephone business it surely means passing the burden along to those who need and use telephone service. Team work in endeavors to put our business on an efficiency basis is needed and the sooner it is done the better it will be for all of us.

Following President Barnhart was a paper by C. L. Jones, secretary-manager of the Athens (O.) Home Telephone Co. Dr. Jones emphasized the foundations of good public relations and showed how public confidence is an essential. The last paper on the morning program by R. V. Achatz, of Aurora, covered transmission problems of the small exchange. The most important thing in removing transmission troubles in the small exchange is the desire of the management to furnish good transmission. With this and with plenty of work on the part of the troubleman, 90 per cent of transmission troubles can be cleared with the equipment available at almost any exchange.

In the afternoon session, Stanley R. Edwards, editor of Telephony, spoke of the benefits of association activities. Mr. Edwards gave the measure of successful association work and applied the measure to results obtained. To the smaller companies especially, the benefits are many times greater than the cost. Mr. Edwards was followed by a discussion of highway problems by Sam Tomlinson of Plymouth. The biggest thing is education of those who have charge of highway work so that the rights of telephone companies may be protected.

"Telephone Research" was the subject of an illustrated lecture by Dr. J. O. Perrine of the American Tel. and Tel. Co., New York. Dr. Perrine used phonograph records to show the various frequencies involved in human speech and the effect of removing certain frequencies upon the intelligibility of speech. Talking motion pictures were also exhibited and the method of voice reproduction made clear. Following Dr. Perrine's lecture was a brief demonstration of the effect of certain faults in telephone lines and equipment upon speech transmission by Mr. Rogers, also of the A. T. and T. organization.

In parallel with the general sessions on Wednesday were meetings for the operators which were attended by a large and enthusiastic group of ladies. In the evening, over 400 men and women sat down at a banquet in the Riley room of the hotel, and after the dinner listened to an address on "An Adventure in Fraternity" by Major Norman A. Ihrie, U. S. A., of Culver Military Academy. The banquet was followed by dancing till a late hour.

The Thursday morning session was devoted to a round table of questions and answers conducted by Otto Marahrens of Fort Wayne and E. S. Welch of Seymour. An hour and a half was devoted to a discussion of over twenty questions submitted. The report of the nominating committee was read and the following were declared elected as directors for a three year term: R. V. Achatz, Aurora; F. O. Cuppy, Lafayette; W. W. Harbaugh; Sullivan; C. R. Hurmence, Elkhart, and Geo. Watts, Knightstown.

New Circulars Issued by Otto Bernz, Inc., Show Latest Equipment

The Otto Bernz Co. Inc., 17-37 Ashland street, Newark, N. J., are now issuing a new set of circulars which illustrates and completely describes their latest styles of torches, furnaces, and some plumbers' tools. These circulars are attractively printed and emphasize the effective points, and are properly punched for insertion in the standard size catalogs. These circulars are very interesting to anyone interested in any of the above equipment and may be secured by addressing the Otto Bernz Co., Inc., 17-37 Ashland St., Newark, N. J.

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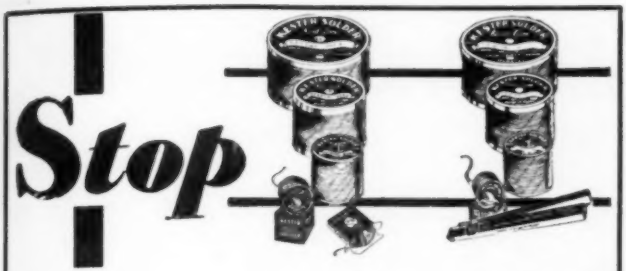

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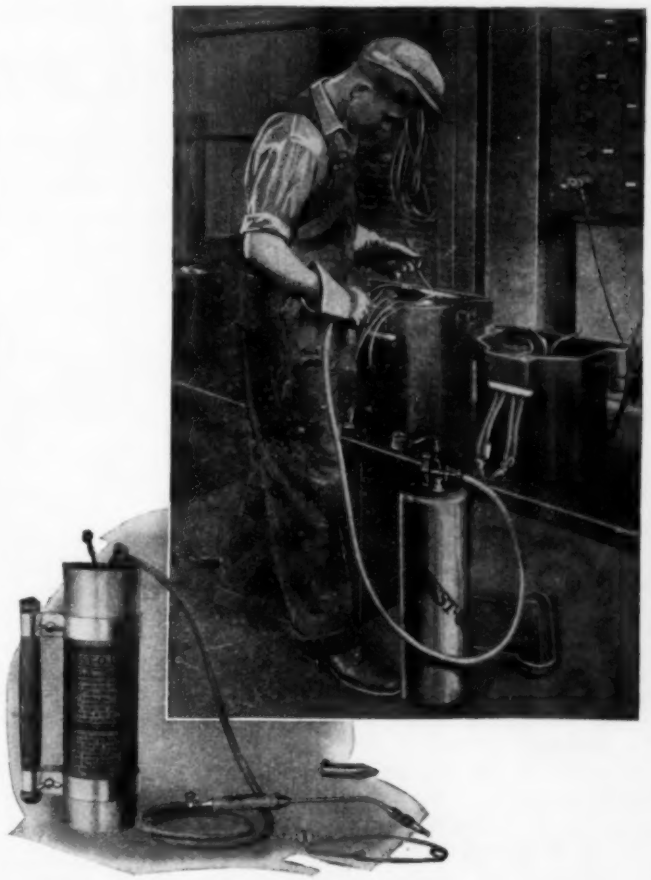

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Who's Who in the Telephone Industry

WILLIAM H. BECK

An Appreciation by J. A. Smith

Just a few months more than a year ago a young Indianan returned to his native state and was selected to a position where ability, tact and thoroughness were essential. It was a trying position, for the eyes of the entire country were watching the new secretary of the Indiana Telephone Association. After fifteen months' tryout it is unanimously agreed that William H. Beck has "made good," not only with the Indiana telephone interests but other states as well.

Rounding out an education at Purdue University at LaFayette, Ind., in 1915, where he graduated with degree of B. S. in E. E., Beck became a student engineer in the plant of the General Electric plant at Schenectady, N. Y., where he had the advantage of one of the finest laboratories of the country. After leaving Schenectady he returned to Indiana and spent some time in the design and operation of street lighting equipment. In 1917 he joined the forces of the Indiana Bell Telephone Company at Indianapolis, and spent a year in preparing commercial forecasts for plant and central office equipment. The following year he became connected with the Indiana Public Service Commission, where he remained two years, the entire time being spent in appraisal and investigation of Indiana telephone plants. During this time he was secretary of the Indianapolis-LaFayette section of the A. I. E. E.

During 1919 he prepared a thesis on "The Valuation of Telephone Properties in Indiana" and was awarded E. E. degree from Purdue University in recognition of this work.

William H. Beck,
Efficient Secretary of the Indiana Telephone Association

Early in 1920 Mr. Beck became assistant manager of the LaFayette Telephone Company where he spent six years, working in every branch of the industry; when, heeding that age-old purported advice of Horace Greely, "Go west, etc.," he started. But the glittering stories of fabulous wealth held in store for those who would heed the call of Florida, he turned his face to the South. Whether he discovered the pot of gold at the end of the rainbow, he does not say.

But in 1928 we find him back in Indiana an older but wiser man. For in the dozen years he had been absorbing much information that, together with his earlier training and hard work, has well fitted him for the duties of the position he now holds with Indiana Telephone Association.

It was in April of 1928 that the Indiana Telephone Association found itself in need of a secretary-treasurer to carry on the work of its organization. In looking over the field, no one could be found that measured up to the demands of the association more fittingly than William H. Beck, and after more than a year of successful performance of the duties of that position, the entire industry of the state of Indiana, as well as outsiders, now feel that the organization acted wisely in its selection of a man to carry on the work in the Buckeye state.

While in Purdue University Mr. Beck was a member of Beta Theta Pi; member of Eta Kappa Nu, Honorary Electrical Engineering Fraternity, and member A. I. E. E.

Now he is a benedict of some 12 years duration, the family consisting of the wife and three daughters. He is a 32 degree Mason.

You couldn't attend the Indiana telephone convention without meeting W. H. Beck. And if you are in the telephone game you wouldn't think of passing through Indianapolis without looking him up. In Indiana it isn't necessary to delve into statistics for information, "just ask Beck—he knows."

Book Review

Telephone and Power Transmission, by R. Bradfield and W. J. John. John Wiley and Sons, Inc., New York.

The portion of this book that will be of interest to telephone men is Part I, which presents a brief treatment of telephone transmission. The purpose of the authors, the first named of whom is responsible for this portion of the book, is to give a presentation of the subject in as concise, simple and practical form as possible. In the more extended treatises on the subject, many telephone men have found such a mass of material that they have become discouraged almost at the start. This work gives the fundamentals without going into great length. The mathematical development follows orthodox lines familiar to those who have read the larger works. The general equations are developed for various terminal conditions and a brief discussion of the secondary constants is included.

While the treatment is necessarily mathematical, the method is straightforward and is easily followed by a reader having an ordinary command of the calculus and elementary differential equations. The book fills a definite need as a brief treatment for those who wish only fundamentals or as a preliminary survey of the subject before an attempt is made to read the standard treatises by Kennelly, Fleming, Hill and Johnson.

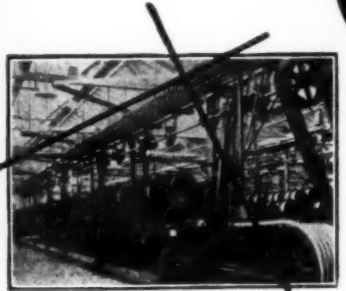
R. W. Glaser Advanced by Kellogg

Telephone exchange managers throughout the country, who are the friends of "Rudy" Glaser, through his long association as sales representative for the Kellogg Switchboard and Supply Company, will be glad to learn that he has been advanced to the position of head of the radio industrial sales department.

His new work will take him entirely out of the telephone field. It will consist of directing sales to radio manufacturers of miscellaneous equipment such as condensers, choke coils, R. F. coils, transformers, wire and cords.

Mr. Glaser has had a long and successful record with the Kellogg Company, having started some twelve years ago in the engineering department.

The best cable shop in the country . . . ..but *it wasn't good enough*



The old way. This machine for stranding cable was the best in the country, but—

Western Electric engineers worked out a new way, stranding cable more quickly, more safely, more economically.

IN equipment and methods the Western Electric telephone cable plant of 1927 set the pace. But that didn't satisfy the company's manufacturing engineers. They put the plant in the test tube of critical judgment—and they came out with something even better.

It meant revising processes, redesigning machines, rebuilding a factory which occupied sixteen huge structures. But it was worth it!

Whether making cable or any of the 10,000 items of telephone apparatus, Western Electric seeks till it finds the better and more efficient and more economical way. As manufacturer for the Bell System this is its share in good telephone service.

Western Electric

MAKERS OF YOUR TELEPHONE

Ramblings

By J. A. S.

In the April issue we mentioned the fact that C. A. Shock of Sherman, Texas, had been awarded a twenty-five jeweled watch as a token of appreciation by his co-workers in commemoration of his twenty-five years' service to the telephone industry. Now here comes along Ed. Blomeyer of Kansas City and tells the world he too has served a quarter century in this great industry. Whether this is a bid for fame or fortune we know not. Whether he receives either we do not know. But this we do know, that there is not a man in the entire industry who has given more of his time and thought to the progress of this utility than has Ed. In a business way Ed has gone "from the bottom of the hole to the top of the pole" and he deserved every promotion he received.

* * *

Runzel-Lenz recently sustained a very severe loss by fire in their factory located at 1751 N. Western avenue, Chicago. They had just recently finished an addition of two stories to their factory in order to meet the growing demands of the trade. But this disaster did not deter them from serving the trade which has looked to them so long for cords. Monday following the fire on Saturday found them in temporary quarters taking care of the customers. It is a cinch that this progressive firm will be running at full capacity before long.

* * *

Descendents from Erin by no means have a corner on humor, as the following from a Texas paper indicates. Whether this creature sprang from a Darwinian branch of some Texas pine or was born in the forks of a northern white cedar pole, deponent sayeth not, but the nationality would indicate that he escaped the revolution in hot tamale-land only to be brought to justice in a court of his peers. The news item says: "A Mexican, convicted in a Dallas court and given a 99-year sentence, was asked what he thought of the verdict; he replied: 'Ha ha, a beeg joke, I fool 'em, I no leeve that long.'"

* * *

Somewhere recently we read the story of Ed Bok's work in founding and financing the Bird Sanctuary and Singing Tower at Lake Wales, Florida. It made great reading, and the pictures were very inspiring; some day we hope to go there and mingle with the birds and be lulled to sleep by the music of the great organ which was placed in the lounging room of this wonderful tower. We are not really certain whether this Bird Sanctuary is for the feathered tribe or for the rich bird who has nothing to do and tries to make a job of it. The lounging and music rooms indicate one thing, and the surroundings or tower quite another. There is probably room for both, but one of the interesting details was the fact that a roof separated the domicile of the lounging "bird" from that of the feather tribe whose flagrant disregard for sanitary conditions is the rule rather than the exception. A personal visit will doubtless dispel all these doubts, and we're for the visit.

* * *

Ernest Irwin of Pomona, California, was again elected secretary of the California Independent Telephone Association. Which shows that the Independents to our extreme west are still using high grade judgment in the selection of a guiding spirit in its inner workings. Ernest is one of these faithful workers whose sole idea is to help some telephone man out of his troubles. One of Sam Jones' colored auditors once remarked to him, after listening to one of his stirring Methodist sermons before an audience of Southern negroes: "Brudder Jones, you has a white skin, but de Lord knows you has a black heart." Brother Erwin is not so much on the loud speaker, but he certainly has a central energy heart that hears all the complaints and is moved to action immediately.

* * *

Driving back from Indianapolis where we attended the Indiana convention we stopped over at Lafayette to see Messrs. Cuppy and Brown, who have worked so faithfully to give that thriving university city just the kind of telephone service that we all expect—whether we pay for it or not. The exchange was visited from top to bottom, and the manner in which it is kept certainly should be an inspiration to the employes.

* * *

Down at Ottawa, Illinois, the writer found the Stewart Brothers busily engaged in turning out test sets for the telephone man who has trouble of his own. They recently received orders for several sets from the Canadian government, while inquiries from Italy spurred the boys on to redouble their efforts. Letters in their files telling of the success of these machines are almost unbelievable. Wording of some of these letters were as strong as Ad Lib's description of Winnie Winkle on his signboard campaign. But these boys have brought relief to many weary linemen who had worn his patience to a frazzle trying to locate his short.

* * *

Gosh don't this warm weather make you wish for a convention on the banks of some fine lake, a week's vacation and expense money furnished? Too bad there is not a Wawasee lake near every convention city, days as long as Alaskan nights and no fishing license necessary. But why dream! Let's all work hard, become millionaires and then hold twelve months' conventions each year at some lakeside.

* * *

Henry Barnhart of Rochester, Indiana, permanent president of the Indiana Telephone Association, fits the job he has in hand so well that it would be hard to find another to fill his shoes. Under the guidance of Mr. Barnhart and Bill Beck, efficient secretary of the Hoosier association, things just naturally work themselves out in a manner pleasing and permanent. We've never delved into ancient literary lore to see what the words "Indiana," Barnhart" and "Beck" mean, but the combination leave the impression that it is "friendliness, courtesy and service."

* * *

The editor of the Oil City Derrick, daily newspaper over at Oil City, Pa., evidently arose from a night of restlessness the other morning and divested himself of something he supposed was responsible for his failure to be lulled by the soothings of Morpheus. Hear him: "The voice with a smile" may be all right in many contingencies, but when we take down the receiver the only thing for which we have an ear is the number. What we want is that call put through in the shortest time possible." But in passing he compliments the Oil City operators by stating that they have that "it" which combines the smile with business and gives you service plus—.

"Men may fume, and men may bawl,
But after all these same men fall."

* * *

Both railroad and steamship companies are now seriously considering the matter of installing two-way radio telephones as additional service to their patrons. This is possible, they say, by installing a radio terminal some place along the lines. Probably the first train to install this equipment will be the "International" between Chicago and Toronto. And then our wives can check up on us, no matter where we are. Personally we believe that our personal liberty is about to be abridged.

* * *

Yes "we" are still making our tours on "all six," that "little old Pontiac" which has pointed its nose into some sixteen states and parts of Canada; a few states have been traversed half a dozen time. It has successfully dodged traffic cops in all these states, and has always put us into our destination on time. Whether it happens to be a good model, our driving, or just darned good luck we do not attempt to say. But when we whisper the destination, time of expected arrival, etc., the car does the rest.

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Reliable CABLE GRIPS

Aerial Cable Pulling Grips made longer than the old standards—do not catch in the rings—last longer.

No.	For Cable Diam. Inches	Length	Weight Each
822	¾ to ⅞	24	7 oz.
823	1 to 1⅜	24	½ lb.
824	1½ to 1⅞	24	¾ lb.
825	2 to 2⅜	24	1½ lbs.
826	2½ to 2⅞	24	1¾ lbs.

Underground Cable Pulling Grips of great strength and toughness—cast steel wires—two ply with brazed ends will outlast a dozen ordinary underground grips.

No.	For Cable Diam. Inches	Length	Weight Each
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807	3 to 3⅜	30	3½ lbs.

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No. 811	51-101	No. 823	657-707
No 812	102-152	No. 824	708-758
No. 813	152-202	No. 825	758-808
No. 814	203-253	No. 826	809-859
No. 815	253-303	No. 827	859-909
No. 816	304-354	No. 828	910-960
No. 817	354-404	No. 829	960-1010
No. 818	405-455	No. 830	1011-1061
No. 819	455-505	No. 831	1061-1111
No. 820	506-556	No. 832	1112-1162
No. 821	556-606	No. 833	1162-1212

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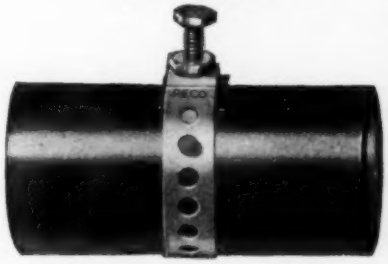

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